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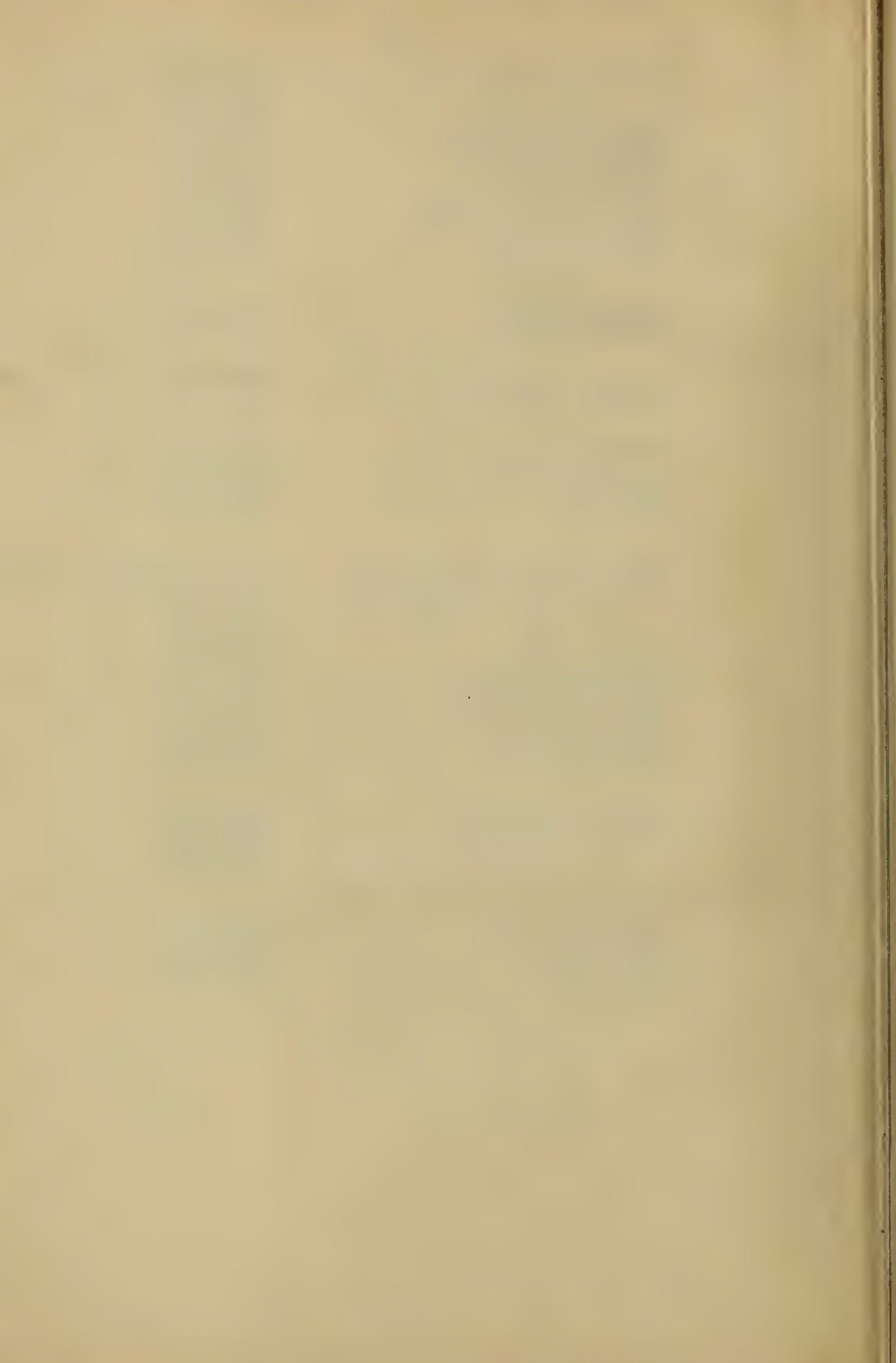
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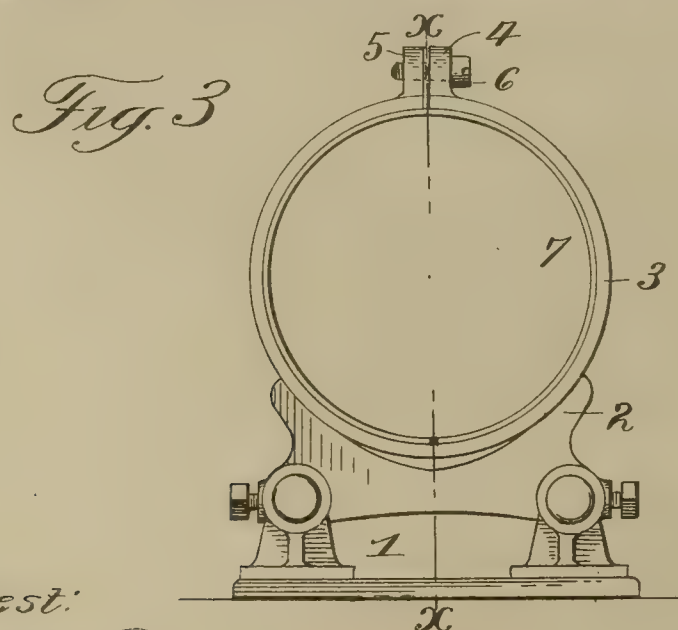
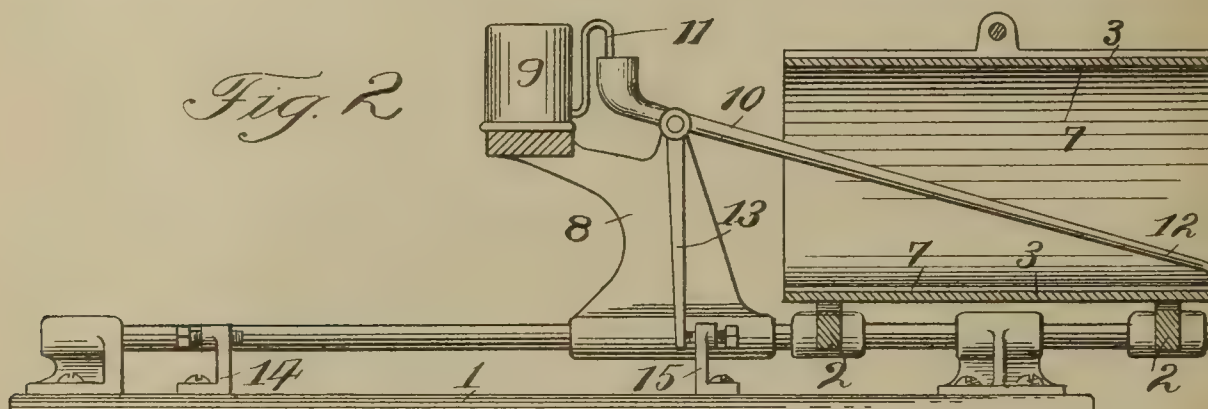
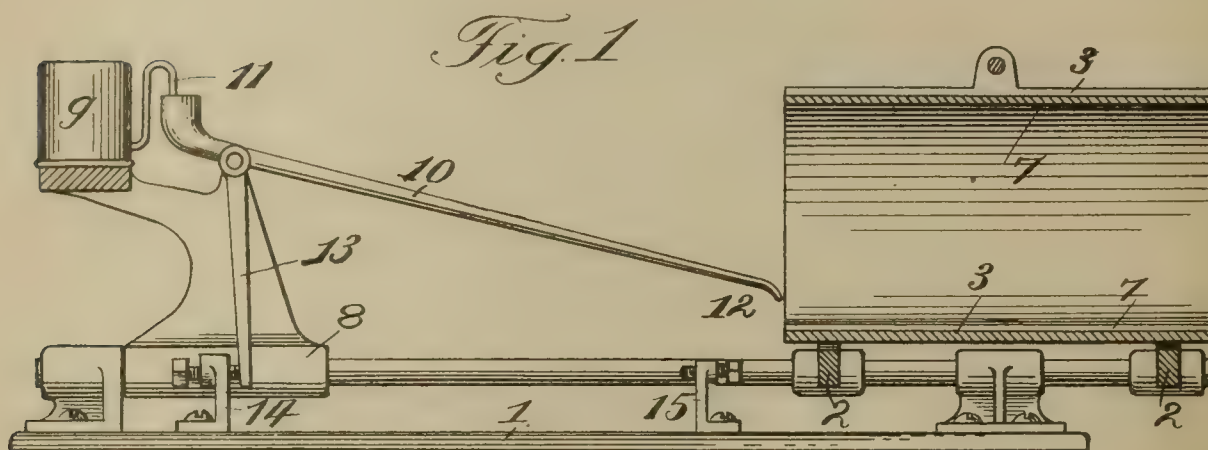




V. M. HARRIS.
 MANUFACTURE OF CYLINDRICAL PHONOGRAPH RECORD BLANKS.
 APPLICATION FILED OCT. 8 1908.

Reissued Jan. 4, 1910.

13,067.



Attest:

J. C. Turner
Jno. F. Oberlin

Inventor:

Vernon M. Harris
 by *J. B. Fay*
 Attorney.

UNITED STATES PATENT OFFICE.

VARIAN M. HARRIS, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE CLEVELAND PHONOGRAPH RECORD COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

MANUFACTURE OF CYLINDRICAL PHONOGRAPH RECORD-BLANKS.

13,067.

Specification of Reissued Letters Patent. Reissued Jan. 4, 1910.

Original No. 854,886, dated May 28, 1907, Serial No. 338,727. Application for reissue filed October 8, 1908. Serial No. 456,847.

To all whom it may concern:

Be it known that I, VARIAN M. HARRIS, a citizen of the United States of America, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in the Manufacture of Cylindrical Phonograph Record-Blanks, of which the following is a specification.

10 This invention relates to means for forming cylindrical phonograph record blanks from sheets of celluloid and has for its object to provide a simple and efficient structural arrangement and combination of parts
15 whereby the sheet of material bent into cylindrical form is securely held and united by a longitudinally extending cemented seam to form a cylindrical blank equal in all respects to the drawn tubes or cylinders heretofore used in the manufacture of phonograph records, all as will hereinafter more fully appear.

In the accompanying drawings:—Figure 1 is a longitudinal sectional elevation, on
25 line $x-x$, Fig. 3, of an apparatus embodying the present invention, and showing the parts in the position in which the carriage has completed an active stroke. Fig. 2 is a similar view showing the parts in the position
30 for the commencement of an active stroke. Fig. 3 is an enlarged end elevation.

Similar numerals of reference indicate like parts in the different views.

Referring to the drawings, 1 represents a
35 stationary slideway of any usual construction, and provided with suitable feet by which it is supported in a horizontal position upon a work bench or table.

2 are a plurality of saddle pieces secured
40 in fixed relation to the slideway 1, and adapted to support the cylindrical work holder in proper position in the apparatus.

3 is the cylindrical work holder above referred to, and consisting of a cylindrical
45 shell of metal, or other equivalent material, slitted along its length to form the longitudinal opening or gap 4 in the wall of the holder as shown.

5 are ears upon the opposed edges of the
50 gap 4, through which pass adjusting screws 6, by which an adjustment in the diameter of the holder can be effected as required in the actual and continued use of the appa-

ratus. The work holder 3 is so constructed as to possess a sufficient degree of resiliency
55 to allow such adjustment to be made.

7 is the sheet of celluloid to be operated on, and which is bent into a cylindrical form and inserted into the interior of the cylindrical holder 3, with the meeting edges and
60 seam formed thereby, located at the under side of the blank celluloid cylinder so formed, and as shown more particularly in Fig. 3.

8 is a carriage sliding longitudinally on
65 the slideway 1, and carrying a supply tank 9 in which is contained a supply of the cementing fluid used in the practical operation of the apparatus, and which fluid will usually consist of a cellulose product dissolved
70 in ether.

10 is a fountain pen pivotally supported on the carriage 8, and having one end connected by a flexible tube 11, with the supply tank 9, while its other end is of an elongated
75 form and ends in a capillary discharge point 12 through which the cementing fluid flows, as said point moves in contact with the work.

13 is a depending operating arm rigidly connected to the fountain pen 10, aforesaid.
80

14 and 15 are stationary stops arranged near the limit of the longitudinal travel of the carriage 9, in each direction, and which are adapted to alternately contact with the arm 13 to raise the discharge point 12 from
85 the work, at the ending of its active stroke, and in like manner depress said discharge point at the ending of its inactive stroke; such operations taking place in an automatic manner during a continued operation of the
90 apparatus.

The operation of the apparatus is as follows:—A sheet of celluloid of the proper dimensions is bent into a cylindrical form and inserted in the interior of the cylindrical
95 work holder 3, which is adjusted to the required diameter by the adjusting screws 6. The work holder is then placed in position on the saddle pieces 2, with the seam of the celluloid cylinder located at the lowermost
100 point in the height of said cylinder as shown. The operator now moves the carriage 8 to bring the discharge point 12 of the fountain pen 10 to the rear end of the interior of the work and work holder, as illustrated in Fig. 105
2, and as such position is reached the stop

15 contacts with the arm 13 to automatically depress the discharge point 12 to an operative position. A return movement is now imparted to the carriage and the discharge point 12 is drawn along the longitudinal seam of the celluloid cylinder 7 to deposit the cementing solution; with the ending of such active or return stroke of the carriage, the stop 14 contacts with the arm 13 to automatically raise the discharge point 12 into its normal inoperative position. The work holder with its contained cylinder of celluloid, is now removed from the apparatus and stacked away to dry out, and is replaced by a succeeding holder and its contained sheet of celluloid, the system requiring a large number of counterpart work holders in the attainment of rapid and perfect work.

20 Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In apparatus of the class described, a work holder comprising a one-piece cylindrical shell of resilient material slitted along its length to form a longitudinal opening in the shell wall, and means for drawing the edges of such opening more or less closely together to vary the diameter of said shell.

30 2. In apparatus of the class described, a work holder comprising a one-piece cylindrical shell of resilient material slitted along its length to form a longitudinal opening in the shell wall, ears upon the edges of such opening, and adjusting screws passing through such ears whereby such edges may be drawn more or less closely together to vary the diameter of said shell.

40 3. In apparatus of the class described, the combination with a horizontally disposed work holder adapted to maintain a sheet of celluloid in a cylindrical form; of a liquid supply member adapted to be inserted within said holder, and means for supporting said member, said holder and means being relatively movable, whereby the member may be drawn longitudinally along the holder.

50 4. In apparatus of the class described, the combination with a horizontally disposed work holder adapted to maintain a sheet of celluloid in a cylindrical form, such sheet having its edges abutting along the lower side of said shell; of a fountain pen adapted to be inserted within said shell, and to contact with the abutting edges of the sheet therein, and means for supporting said fountain pen, said means being movable longitudinally of said shell.

60 5. In apparatus of the class described, the combination with a horizontally disposed work holder adapted to maintain a sheet of celluloid in cylindrical form, such sheet having its edges abutting along the lower side of the said shell; of a fountain pen adapted to

be inserted within said shell and to contact with the abutting edges of the sheet therein, means for supporting said pen, said means being movable longitudinally of said shell and said pen being movable into and out of contact with such sheet's edges. 70

6. In apparatus of the class described, the combination with a horizontally disposed work holder adapted to maintain a sheet of celluloid in substantially cylindrical form, of means for guiding a member longitudinally along said holder. 75

7. In apparatus of the class described, the combination with a horizontally disposed work holder adapted to maintain a sheet of celluloid in substantially cylindrical form, such sheet having its edges abutting along the lower side of said cylinder, of means for guiding a member along such abutting edges. 80 85

8. In apparatus of the class described, the combination with a horizontally disposed work holder adapted to maintain a sheet of celluloid in substantially cylindrical form, of a liquid supply member adapted to be inserted within said holder, said holder and member being relatively movable whereby the member may be drawn longitudinally along the holder, and means for guiding said member. 90 95

9. In apparatus of the class described, the combination with a horizontally disposed work holder adapted to maintain a sheet of celluloid in substantially cylindrical form, such sheet having its edges abutting along the lower side of said cylinder, of a fountain pen adapted to be inserted within said holder, and to contact with the abutting edges of the sheet therein, said pen being movable longitudinally of said holder, and means for so guiding said pen. 100 105

10. In apparatus of the class described, the combination with a horizontally disposed work holder adapted to maintain a sheet of celluloid in substantially cylindrical form, such sheet having its edges abutting along the lower side of said cylinder, of a fountain pen adapted to be inserted within said holder and to contact with the abutting edges of the sheet therein, said pen being movable both longitudinally of said holder, and into and out of contact with such sheet's edges, and means for so guiding said pen. 110 115

11. In apparatus of the class described, the combination with a horizontally disposed work holder adapted to maintain a sheet of celluloid in cylindrical form, such sheet having its edges abutting along the lower side of the said shell; of a fountain pen adapted to be inserted within said shell and to contact with the abutting edges of the sheet therein, said pen being movable longitudinally of said shell; and means adapted to automatically move said pen into and out of 120 125 130

contact with such sheet's edges incidentally to the longitudinal movement of said pen.

12. In an apparatus for forming sheet celluloid into cylindrical phonograph record
5 blanks, the combination of a cylindrical work holder adapted to maintain a sheet of celluloid in a cylindrical form, means for supporting the work holder in a horizontal position a slideway arranged longitudinally
10 to the work holder, a carriage moving on said slideway, and a fountain pen carried by said carriage.

13. In an apparatus for forming sheet celluloid into cylindrical phonograph record
15 blanks, the combination of a longitudinally slotted cylindrical work holder adapted to maintain a sheet of celluloid in a cylindrical form, means for effecting a change in the diameter of said work holder, means for
20 supporting the work holder in a horizontal position, a slideway arranged longitudinally to the work holder, a carriage moving on said slideway, and a fountain pen carried by said carriage.

14. In an apparatus for forming sheet celluloid into cylindrical phonograph record
25 blanks, the combination of a cylindrical work holder adapted to maintain a sheet of celluloid in a cylindrical form, stationary saddle pieces for supporting the work holder
30 in a horizontal position, a slideway arranged longitudinally to the work holder, a carriage moving on said slideway, and a fountain pen carried by said carriage.

15. In an apparatus for forming sheet celluloid into cylindrical phonograph record
35 blanks, the combination of a longitudinally slotted cylindrical work holder adapted to maintain a sheet of celluloid in a cylindrical
40 form, stationary saddle pieces for support-

ing the work holder in a horizontal position, a slideway arranged longitudinally to the work holder a carriage moving on said slideway, and a fountain pen carried by said carriage.

16. In an apparatus for forming sheet celluloid into cylindrical phonograph record
blanks, the combination of a cylindrical work holder adapted to maintain a sheet of celluloid in a cylindrical form, means for
50 supporting the work holder in a horizontal position, a slideway arranged longitudinally to the work holder, a carriage moving on said slideway, a supply tank on said carriage, a pivoted fountain pen carried by said
55 carriage connected with said tank, and means for tilting said pen near the ends of its travel.

17. In an apparatus for forming sheet celluloid into cylindrical phonograph record
60 blanks, the combination of a longitudinally slotted cylindrical work holder adapted to maintain a sheet of celluloid in a cylindrical form, means for effecting a change in the diameter of said work holder, means for
65 supporting the work holder in a horizontal position, a slideway arranged longitudinally to the work holder, a carriage moving on said slideway, a supply tank on said carriage, a pivoted fountain pen carried by said
70 carriage and connected with said tank, and means for tilting said pen near the ends of its travel.

Signed by me this 6th day of October, 1908.

VARIAN M. HARRIS.

Attested by—

CHRISTINE E. ARNS,
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E. R. JOHNSON.
TALKING MACHINE.
APPLICATION FILED MAR. 3, 1908.

Reissued Jan. 4, 1910.

13,069.

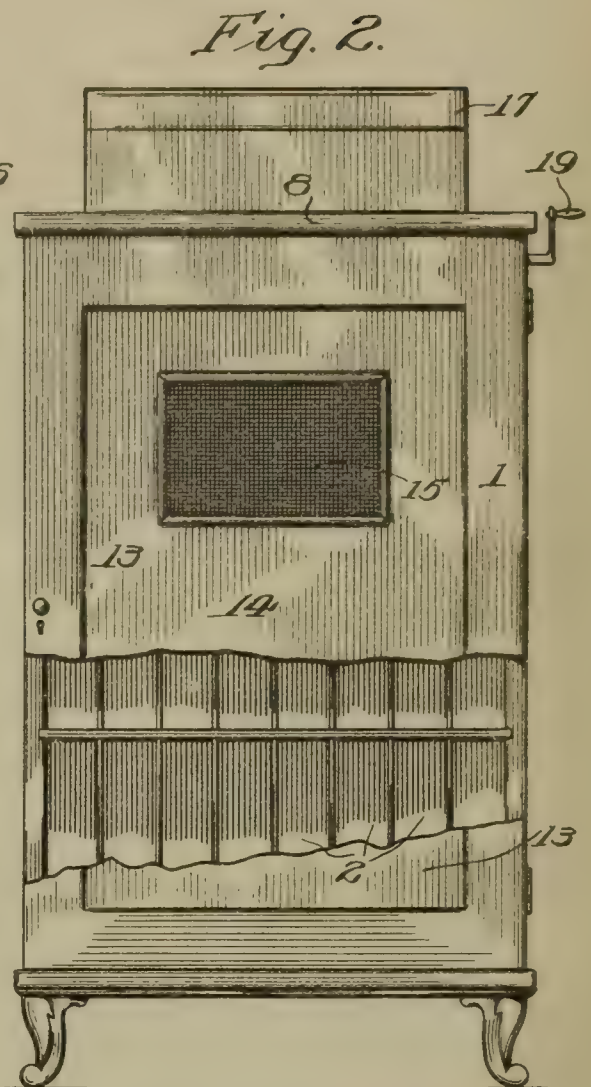
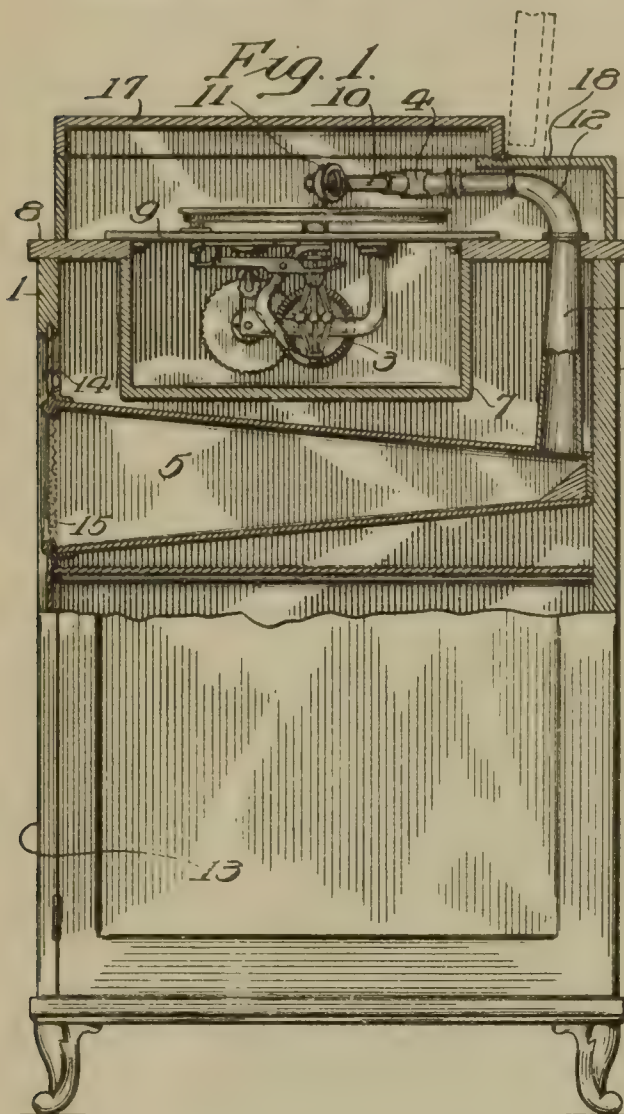
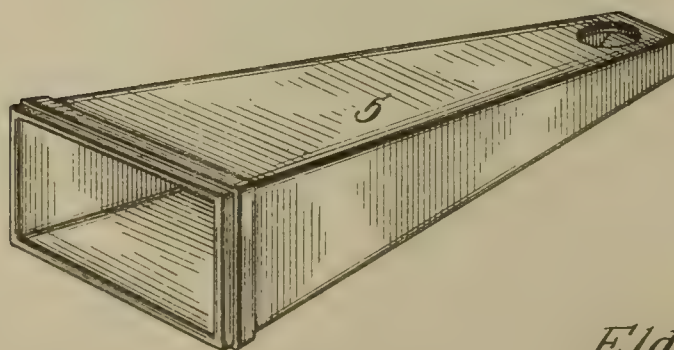


Fig. 3.



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UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF MERION, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

TALKING-MACHINE.

13,069.

Specification of Reissued Letters Patent. Reissued Jan. 4, 1910.

Original No. 856,704, dated June 11, 1907, Serial No. 235,921. Application for reissue filed March 3, 1908. Serial No. 419,057.

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of Merion, county of Montgomery, State of Pennsylvania, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, clear, and complete disclosure.

My invention relates to the art of recording and reproducing sounds, and has for its object, among others, to provide improvements in apparatus for reproducing sounds from a record of the same, by means of which the quality and naturalness of the recorded sounds are reproduced with greater faithfulness, and also with a reduction of the commingled extraneous sounds, which are usually present, and which appear to be made by the operation of the reproducing apparatus, for instance, among others, the scratching usually produced by the contact of the reproducing stylus and record when reproducing, and other sounds given out by parts of the apparatus when in operation, among which may be mentioned, the sounds that might be made by the motor when operating.

Among the other objects of my invention is to provide apparatus for imparting resonance to the reproduced sounds; to modify such sounds after amplification; to deflect the sounds after amplification; to protect and conceal the operative parts of the apparatus, to improve the appearance of the talking machine as a whole, so as to provide an ornamental piece of furniture, and to provide, in connection with the cabinet of such a talking machine, convenient means for the storage of records, needles and other accessories.

In the accompanying drawings is illustrated one form of apparatus containing my improvements, by means of which the foregoing objects are attained, and by which is accomplished the new results, all of which will hereinafter be fully described and claimed, and which form a part of this specification, and in which—

Figure 1 represents one form of my improved talking machine and cabinet therefor, shown in section at its upper portion; Fig. 2 is a front elevation thereof showing

the lower portion of the front of the casing broken away, and Fig. 3 is a detail perspective view of the sound amplifying portion of the sound conducting tube.

Referring to the drawings, the numeral 1 indicates a rectangular cabinet or casing, the lower portion of which is preferably divided into a number of compartments 2, each of which is of such size and shape as to receive a plurality of records either singly or in the form of portfolios or volumes containing a number of records. The upper portion of the cabinet 1 contains the talking machine motor 3, the reproducing mechanism 4 and the flattened amplifying portion 5 of the sound conducting tube 6. The casing 7 for the motor 3 is preferably suspended from the top 8 of the cabinet 1 and the base plate 9 of the motor 3 preferably rests upon said top 8. The reproducing mechanism 4 which comprises a pivoted hollow arm 10 having a sound box 11 attached to the outer end thereof is supported by the top 8 and instead of curving upwardly, as in the usual form of talking machines, curves downwardly as indicated at 12 and connects with the vertical sound conveying tube 6. Beneath the motor casing 7 and extending from the back to the front of the cabinet 1 is the tapering amplifying portion of the sound conducting tube and the smaller end thereof is connected with the vertical sound conveying tube 6 in any suitable manner. The front side of the cabinet is provided with an opening which is closed by a door 13 which gives access to that portion of the form of cabinet 1, shown in the drawing, in which is contained the amplifier 5. The said door 13 is hinged and provided with a panel 14 in which there may be, if desired, an opening covered by a fine mesh netting or screen 15. The rigid and inflexible door 13 of the cabinet may be swung on its hinges to partly or fully open or close the outer end of the amplifying portion of the sound conveying tube, and the air chamber surrounding the said amplifying portion. When partly opened the sounds issuing from the amplifying horn, or surrounding air chamber, or both, will be deflected and the character and volume of the reproduced sounds will be modified by

swinging the door to different positions. The door may also allow of access to the compartments 2.

The top portion of the cabinet or casing 1 is preferably formed into a top compartment, which has a pivoted cover 17 hinged to a fixed horizontal portion 18 of the form of compartment 16, shown in the said drawings. This pivoted cover is of sufficient size to allow free access to the turntable and reproducing mechanism, and at the same time allows the fixed portion 18 of the top compartment 16 to form an additional support for the reproducing mechanism. The winding shaft of the motor preferably extends through the outer portion of the casing 1 and terminates in the winding crank 9.

One of the objects of my invention, namely, the improvement in the quality and naturalness of the reproduction, and which is accomplished in my apparatus is due to the inclosing of the stationarily mounted amplifier 5, and not dependent upon the means for modifying or deflecting the sound, nor for preventing the scratching from commingling with the reproduced sound, that is to say, I have found in practice that so inclosing the amplifier does improve the quality and naturalness of the reproduced sound, and having secured such new result, I desire to claim broadly, an apparatus embodying such means. I have also found that when there is an air space between the amplifying means and its inclosing casing, improved results appear to be attained, and still more so when this air space between the amplifying means and its casing may be opened to the atmosphere, so that sounds therein may commingle with the sounds emanating from the interior of the amplifier. This last result, of course, is accomplished when the door or closure is open, as is manifest. This part of my invention rests for its novelty upon the new results which are accomplished thereby, namely,—(1) the inclosing of the amplifier; (2) the formation of the air space around said amplifier; and (3) the opening of said air space as described, as hereinafter claimed, and are three different subdivisions of this part of my invention, and, as before stated, are independent of the means for modifying and deflecting the sounds after amplification, or the means by which the commingling of the scratching and the amplified sounds is reduced. I have also found that such amplifier 5 so arranged acts as a resonator, or, in other words, it provides a combined amplifier and resonator, by which resonance is imparted to the amplified sounds which, of course, is an advantage and a new result, but my broad invention of employing an inclosed resonator, or an inclosed combined amplifier and resonator is not limited to the

cross sectional shape thereof. I do not, however, claim to be the inventor of the particular shape of amplifier shown in the drawings of my application, for I believe that the flattened amplifier or an amplifier oblong in cross section, or an amplifier the major portion of which has cross sectional axes of substantially different length, to be the invention of another, and I expressly disclaim the same.

In addition to the results I have just described, there is, of course, the modification and deflection of the reproduced sounds after amplification, which is accomplished by a closure or swinging door 13 as described, although it will be understood that such a sound deflector and modifier could be arranged in various other shapes.

It is obvious that by inclosing the reproducing apparatus within the upper compartment 16, I am enabled to reduce the amount of scratching which commingles with the sounds emanating from the combined amplifier and resonator, and also the sounds that emanate from the outside of the diaphragm, which would otherwise commingle with the amplified sound to which resonance has been imparted, are reduced.

If preferred, the motor or operating means 3 can be inclosed within the casing 7, and when so inclosed said casing serves to confine, to a great extent, therein, any noises which might be caused by the motor when in operation.

In addition to the improvement in the quality and naturalness of the reproduction by inclosing the amplifier, it is manifest, of course, that the appearance of the complete apparatus is made much more pleasing, and permits a greater latitude in improving the appearance of the device, while the advantage of having a storage place for records as a part of the apparatus itself, is obvious.

For the purpose of preventing extraneous forces from interfering with the vibration of the amplifier walls, or, in other words, preventing extraneous vibration of the amplifier and detracting from the purity of the tone reproduced, means are provided for embracing the major portion, or one of the sections, of the amplifier, and this means may vary within wide limits. In the best constructions, however, this embracing means will consist of an inclosure in which the major portion of the amplifier is located. The inclosure may be variously located. In the best constructions, however, it will be so located as to embrace the major portion of the amplifier in a position below the record and talking machine. The amplifier may be variously located within the inclosure, but in the best constructions it will be substantially horizontally positioned, and the inclosure itself will serve as a rigid support for the major portion of the amplifier. The inclo-

sure being stationary and the major portion of the amplifier being rigidly supported by the inclosure, it follows that the major portion of the amplifier is supported in a fixed position within the inclosure, and below the record and talking machine. In the best constructions, the inclosure is formed by the walls and partitions of the cabinet inclosing the entire apparatus.

For the purpose of preventing extraneous noises from detracting from the purity of the tone reproduced, means are provided for isolating extraneous noise from the sounds or tones issuing from the amplifier. As hereinbefore explained, the noise produced by the operating mechanism of the talking machine is isolated by its inclosure in a compartment. Other noises detrimental to the purity of the reproduced tone are, however, found in machines heretofore constructed. Means are provided, therefore, for isolating the noise produced by the contact of the reproducer stylus with the record from that issuing from the amplifier, and this means may vary within wide limits. In the best constructions, this means consists in a compartment in which the record and reproducer are located.

It is understood, of course, that my invention is not confined to the particular form of apparatus herein shown and described, and, therefore, I claim broadly the right to employ all equivalent instrumentalities coming within the scope of the claims, and by means of which the objects of my invention are attained, and the new results accomplished, as herein set forth, as it is obvious that the particular embodiment herein shown and described is only one of many that can be employed to attain these objects and accomplish these results.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent of the United States is:

1. In a talking machine, the combination with sound reproducing means, of an amplifier connected therewith, an inclosure provided with a lateral opening and supporting the major portion of said amplifier in a fixed position, the delivery end of said amplifier being adjacent said opening, and an inflexible door operating in front of the delivery end of said amplifier.

2. In a talking machine, the combination with sound reproducing means, of an amplifier connected therewith, an inclosure provided with a lateral opening and supporting the major portion of said amplifier in a fixed position, the delivery end of said amplifier being adjacent said opening, and a rigid and adjustable closure for said opening.

3. In a talking machine, the combination with sound reproducing means, of an amplifier connected therewith, an inclosure provided with a lateral opening and supporting

the major portion of said amplifier in a fixed position, the delivery end of said amplifier being adjacent said opening, and a pivoted door operating in front of the delivery end of said amplifier.

4. A sound reproducing means comprising a main casing provided with a lateral opening, a sound reproducer within said casing, a motor compartment within said main casing, a motor in said compartment, an amplifier, a sound conveyer connected with said reproducer and with said amplifier, a hinged door arranged to open and close said opening in said main casing and located in front of said amplifier.

5. A sound reproducing machine comprising a sound reproducer inclosed within a main casing, an inner motor casing, a motor within said casing, an amplifying horn beneath said casing, a sound conveyer connecting said reproducer with said amplifying horn, an inflexible and adjustable closure in the front of the main casing and in front of the mouth of said horn.

6. A sound reproducing machine comprising a main casing provided with a lateral opening, a removable cover upon said main casing, a sound reproducer within said main casing, a motor compartment within said main casing, a motor within said compartment, an amplifying horn, a sound conveyer connecting said reproducer with said sound amplifying horn, a hinged door arranged to open and close said opening in said main casing in front of said amplifying horn.

7. A sound reproducing machine comprising a main casing, a sound reproducer within said casing, a motor, an amplifying horn and a sound conveyer connecting said reproducer with said amplifying horn all within said casing, a rigid door for said main casing in a side thereof and in front of said amplifying horn to modify the reproduced sound.

8. The combination with a talking machine and an amplifying horn connected thereto, of a casing completely inclosing said talking machine and horn, and a rigid swinging door in said casing located adjacent the mouth of said horn.

9. A sound reproducing machine comprising a main casing, a reproducer inclosed within said main casing, a motor within said main casing, an amplifying horn in said casing, a sound conveyer connecting said reproducer with said amplifying horn, a rigid and adjustable closure in the front of the main casing and in front of the mouth of said horn.

10. In a talking machine, an amplifying horn, a mesh, netting or screen extending transversely across the same and adjustable with respect thereto.

11. In a talking machine, an amplifying horn, and an adjustable mesh, netting or

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screen extending transversely of the mouth of said horn.

12. In a talking machine, an amplifying horn, and a mesh, netting or screen extending transversely of the mouth thereof and mounted to swing toward and away from said mouth.

13. In a talking machine, a casing, a tubular arm secured to said casing, a movable tone arm mounted upon, communicating with and wholly supported by one end of said tubular arm, and an amplifier within said casing communicating with the other end of said tubular arm.

14. In a talking machine, the combination with sound reproducing means, of a stationary amplifier coöperatively connected therewith, an inclosure embracing the major portion of the amplifier, a divided cabinet inclosing the talking machine and provided with a series of partitions forming compart-

ments for the storage of records and a door to open and close the mouth of the amplifier and to give access to said compartments.

15. In a sound reproducing machine, a main casing, a sound reproducer inclosed within said casing, a motor within said casing an amplifying horn beneath said motor, a series of small compartments below said horn, a sound conveyer connecting said reproducer with said horn, and an adjustable closure for opening and closing the mouth of said amplifier and for giving access to said compartments.

In witness whereof I have hereunto set my hand this twenty-fifth day of February, A. D. 1908.

ELDRIDGE R. JOHNSON.

Witnesses:

G. A. GUERRA,
A. E. GRIFFITH.

G. L. COLEMAN.
MOUNTING FOR SOUND BOXES.
APPLICATION FILED JAN. 29, 1906.

946,014.

Patented Jan. 11, 1910.

Fig. 1.

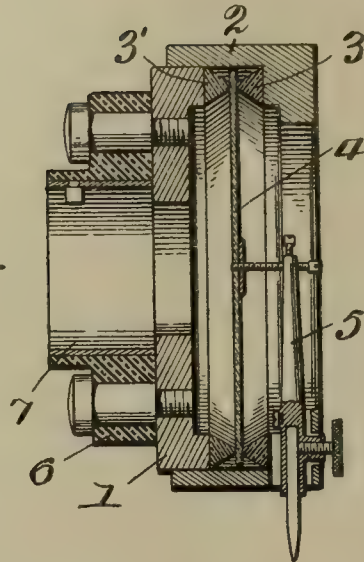
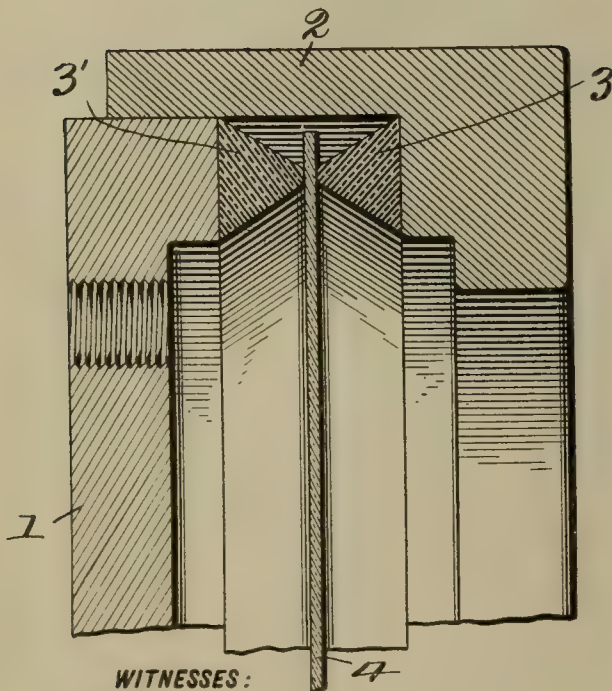


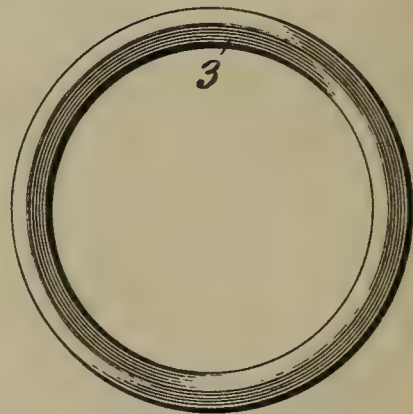
Fig. 2.



WITNESSES:

J. E. Barry
Walter A. Holden

Fig. 3.



INVENTOR
George L. Coleman

BY
1 time test.
ATTORNEY.

UNITED STATES PATENT OFFICE.

GEORGE L. COLEMAN, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

MOUNTING FOR SOUND-BOXES.

946,014.

Specification of Letters Patent.

Patented Jan. 11, 1910.

Application filed January 29, 1906. Serial No. 298,372.

To all whom it may concern:

Be it known that I, GEORGE L. COLEMAN, a citizen of the United States, residing in Camden, in the county of Camden and State of New Jersey, have invented certain new and useful Improvements in Mountings for Sound-Boxes, of which the following is a full, clear, and complete disclosure.

My invention relates to certain improvements in sound recording and reproducing devices, and more particularly to that part of the same known as sound boxes.

The object of my invention is to provide a means for mounting a diaphragm in the sound boxes in such a manner that the volume is greater and quality of the tone is much clearer and more distinct and natural than heretofore rendered.

With this object in view, my invention consists in providing a simple and efficient means for securing the diaphragm in the sound box, whereby the vibratory action of the diaphragm is rendered more efficient and the diaphragm more sensitive to the action of the sound waves and movement of the stylus bar.

My invention further consists in features of construction and manner of operation which will be hereinafter more fully described in the following specification and the accompanying drawing, in which like reference characters refer to corresponding parts.

In the drawing, Figure 1 is a transverse section of the sound box, showing the needle and part of the stylus bar in elevation; Fig. 2 is an enlarged fragmentary portion of Fig. 1; Fig. 3 is an elevation of one of my gasket rings.

Referring to Figs. 1 and 2, 1 represents the sound box frame, which is made up of the sections 1 and 2, the cylindrical wall of the latter being slipped over the cylindrical wall of the former. The section 2 is provided on its interior surface with a step or seat for the reception of one of the rings or gaskets 3. Section 1 has its upper periphery constructed in the form of an annular seat for the reception of the other rings or mountings 3'. These rings or gaskets are composed of a soft rubber or other yielding material and may be resilient, so that in their normal condition they are of such a configuration as to conform to their bearing surfaces in the sound box, from which they

may be removed when contracted. The said rings or mountings are triangular in cross section, and have their base portions bearing against their respective seats and their edges oppositely disposed for the purpose of retaining the diaphragm 4 in position. Connected with the diaphragm in any suitable manner is the stylus bar 5, and to the face of section 1 of the box is attached the usual rubber ring 6, within which is the tubular sleeve 7 for attachment to the horn and supporting the arm of the reproducing machine. The oppositely disposed circular edges of the mounting rings 3—3' may be sharp or knife-like, but I prefer to slightly round or bevel the same. The diaphragm 4 is confined between these circumferential edges, and is in slight contact around that portion of its edges within and adjacent to its periphery. The sections 1 and 2 of the sound box may be so adjusted to each other as to bring the circumferential edges of the rings 3—3' into contact with the diaphragm, according to the tension required.

Although I have described my rings as being detachable and having their circumferential edges in contact with the diaphragm, this arrangement is not essential, as the said yielding portions may be integral with the sound box, or the circumferential edges may be in contact with the said box instead of the diaphragm, provided that those parts of the rings between which the diaphragm is supported are in contact with that portion thereof which is within and adjacent to its periphery, and further, I have described the annular mountings or rings as being triangular in cross section, but the same may be of any other configuration in cross section, provided circumferential edges of contact are presented.

It will be seen, from the above description, that the diaphragm is free at its edges and that the only portions of the same that are in contact are those that lie immediately between the edges of the yielding rings and by virtue of the yielding action of the rings and the circumferential nature of the contact, the interference with the vibratory action of the diaphragm is reduced to a minimum.

The above described means for mounting the diaphragm is illustrated in its preferred form, but I do not wish to limit myself to such, as other forms may be employed without departing from my invention as claimed.

Neither do I wish to be restricted by the terms used to describe the different parts set forth, nor by the exact construction herein illustrated and described, but reserve the right to utilize any modification or equivalents thereof, provided the same are within the scope of my invention, as pointed out in the appended claims.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:—

1. In a sound recording and reproducing machine, the combination of a pair of soft yielding rings, triangular in cross section, with a diaphragm retained between them, the edge of said diaphragm being free.

2. In a sound recording and reproducing machine, the combination with a casing of soft yielding rings, triangular in cross section and oppositely disposed, with a diaphragm retained between said rings, the edge of said diaphragm being free.

3. In a sound box, a pair of soft yielding rings, each having one face thereof tapered to form an edge and a diaphragm retained between said edges, the edge of said diaphragm being free.

4. In a sound box, a pair of soft yielding rings, each having one face thereof tapered to form an edge and its opposite facing flat to conform to a seat, and a diaphragm retained between said rings, the edge of said diaphragm being free.

5. In a sound box, a pair of yielding rings of soft material each having one face thereof tapering to form an edge and a diaphragm retained between said edges.

6. In a sound box, a pair of yielding rings, made of solid soft rubber or a like composition, each having one face thereof tapered to form an edge and a diaphragm retained between said edges.

7. In a sound box a pair of rings made of solid soft rubber or a similar composition, and being triangular in cross section, and a diaphragm retained between said rings.

8. In a sound box, a pair of solid soft rings, each having one face thereof tapered to form an edge, and a diaphragm retained between said edges.

9. In a sound box, a pair of solid soft resilient rings, each having one face thereof tapered to form an edge and a diaphragm retained between said edges.

10. A sound box made up in sections, one section having an annular seat or shoulder therein and another section having a corre-

sponding seat, a pair of soft yielding rings each having one face thereof tapered to form an edge and its opposite face flat and bearing against one of said seats, and a diaphragm retained between the edges of said rings, said sections being longitudinally slidable with respect to each other.

11. A sound box made up in sections, one section having an annular seat or shoulder therein and another section having a corresponding seat, a pair of soft rubber rings, each having one face thereof tapered to form an edge and its opposite face flat and bearing against one of said seats, and a diaphragm retained between the edges of said rings, said sections being longitudinally slidable with respect to each other.

12. A sound box made up in sections, one section having an annular seat or shoulder therein and another section having a corresponding seat, a pair of soft solid rubber rings, each having one face thereof tapered to form an edge and its opposite face flat and bearing against one of said seats, and a diaphragm retained between the edges of said rings, said sections being longitudinally slidable with respect to each other.

13. In a sound box a pair of yielding portions of soft material, each portion being tapered to form an edge and a diaphragm held between said edges.

14. In a sound box a pair of yielding portions of soft material, each portion being tapered to form an edge, and a diaphragm held between said edges, the edge of said diaphragm being free.

15. In a sound box a pair of yielding portions of soft material and a diaphragm held between the said portions, each portion being substantially V-shaped in cross section and converging toward said diaphragm.

16. In a sound box the combination with a casing of a yielding tubular extension secured to the rear side thereof and a non-yielding lining in said yielding tubular extension, the inner edge of said lining being in contact with the rear side of said casing and the outer edge of said lining being flush with the rear face of said extension.

In witness whereof I have hereunto set my hand this twenty-sixth day of January, 1906.

GEORGE L. COLEMAN.

Witnesses:

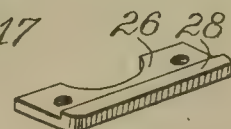
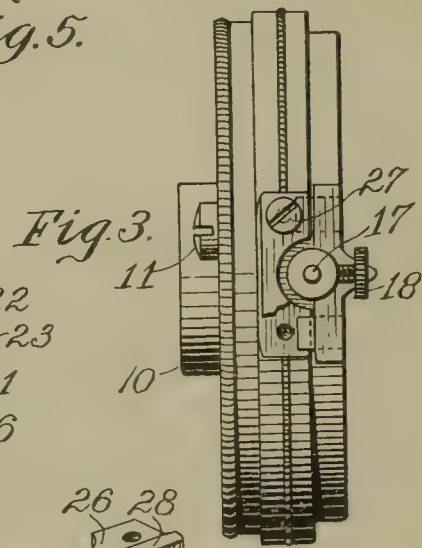
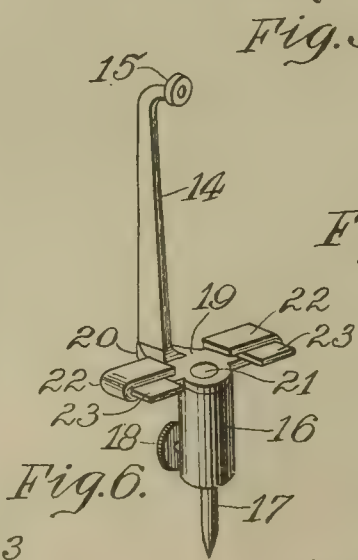
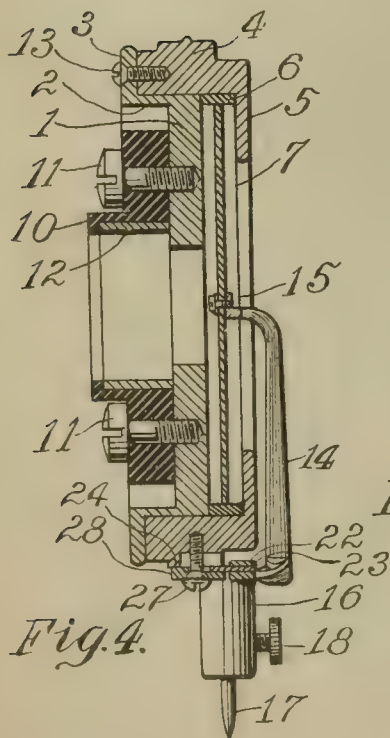
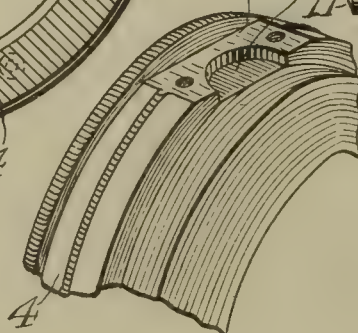
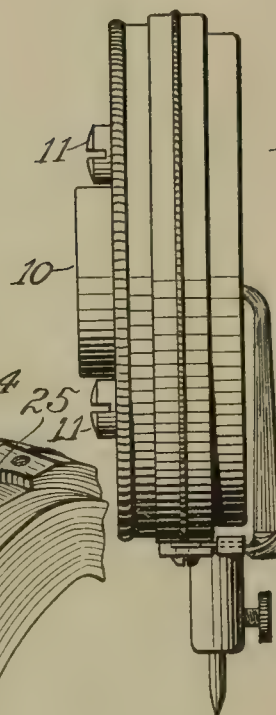
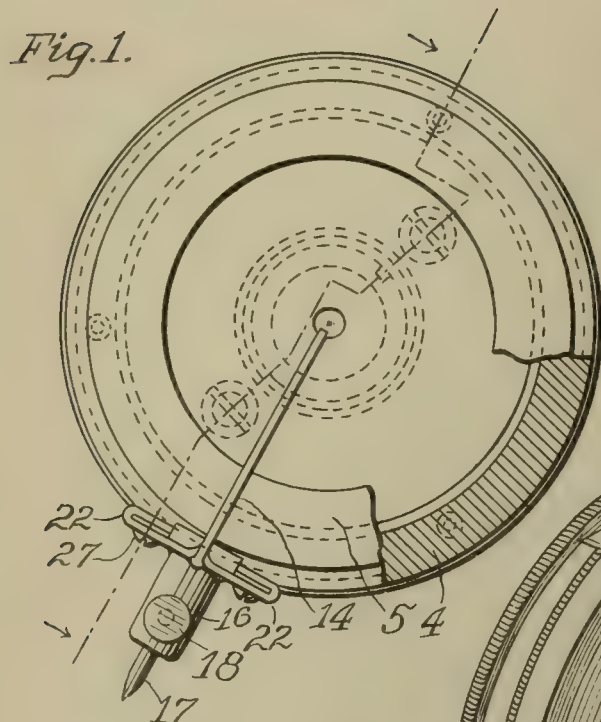
WM. EARLY,

CHAS. K. BENNETT.

G. L. COLEMAN.
SOUND BOX.
APPLICATION FILED SEPT. 12, 1907.

946,015.

Patented Jan. 11, 1910.



INVENTOR

George L. Coleman.

BY

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ATTORNEY

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UNITED STATES PATENT OFFICE.

GEORGE L. COLEMAN, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-BOX.

946,015.

Specification of Letters Patent.

Patented Jan. 11, 1910.

Application filed September 12, 1907. Serial No. 392,443.

To all whom it may concern:

Be it known that I, GEORGE L. COLEMAN, a citizen of the United States, and a resident of the city of Camden, county of Camden, and State of New Jersey, have invented certain new and useful Improvements in Sound-Boxes, of which the following is a full, complete, and exact description.

The main objects of my invention are to simplify the construction of the sound box, with a view to rendering the parts readily removable and replaceable; to so design and combine the parts as to form a compact, neat and durable construction; to provide an improved mounting for the diaphragm; to provide means for preventing injury to the diaphragm; to provide an improved stylus bar mounting; to provide an improved yielding mounting for the box; and to provide other improvements which will appear as the invention is further disclosed.

In the accompanying drawings: Figure 1 is a front elevation of a sound box constructed in accordance with this invention; Fig. 2 a side elevation of the same; Fig. 3 a bottom plan view of the same; Fig. 4 a longitudinal section of the same upon line 4-4 of Fig. 1 looking in the direction of the arrows; Fig. 5 a fragmentary perspective upon an enlarged scale of one side of the sound box casing; Fig. 6 a perspective in detail of the stylus bar; and Fig. 7 a perspective in detail of the plate for securing the stylus bar to the box.

Referring to the drawings, the device comprises a casing consisting of a flat annular plate 1, provided at its outer periphery with a rearwardly extending cylindrical flange 2, integral therewith and having upon its rear edge an outwardly extending flat annular flange 3, the flanges forming a recess for the reception of the inner edge of a cylindrical cap or cover 4 having upon its front edge an inwardly extending annular flange 5, forming the face of the box.

In an internal groove between the front of the plate 1 and the inner surface of the flanged cover 4 carried thereby, is a cylindrical ring 6, which forms a mounting for the diaphragm 7. The ring 6 is substantially rectangular in cross section, and equal in width and outside diameter to the width and diameter of the said groove.

The circular plate 1 forming the rear side of the sound box is provided, concentric with its central aperture, with a yielding tubular extension 10, of soft rubber or other suitable material, secured to the rear face of the plate by means of the screws 11. This tubular extension has its outer end reduced in outside diameter, and has within its bore a non-yielding bushing or lining 12 of brass or similar material, and is adapted to be secured over a sound conducting arm for transmitting the sound waves from the diaphragm to the usual amplifier.

The front and rear portions of the sound box casing are held together by means of screws 13 extending longitudinally of the box through the outwardly extending flange of the rear plate of the box, and into the rear face of the cylindrical cap forming the sides and front of the box.

The stylus bar has a flat tapering inner portion 14, and the bar is phonetically connected at its inner end 15 of the diaphragm. The outer portion 16 of the stylus bar is offset rearwardly from the inner portion, is cylindrical in shape, and has a central longitudinal socket for the reception of a needle 17, which is held in place by a thumb screw 18.

The inner and outer portions of the stylus bar are connected by means of a plate 19 which is substantially uniform in thickness, and which has the front side 20 thereof bent inwardly away from the plane of the other side, and extending in a direction substantially oblique to the flat portion of the bar, and is slotted to receive the outer end of said portion, which is soldered or otherwise secured in position. The rear side of this plate which is semi-circular in shape and in a plane perpendicular to the outer end of the bar, is provided with a circular opening into which is riveted the reduced inner end 21 of the said outer end of the bar, the outer surface of the plate resting against the shoulder of the bar formed by the reduced end. This plate 19 is further provided with lateral extensions 22, projecting oppositely in a direction parallel to the diaphragm, the inner edges of these projections being in the same straight line, substantially in alignment with the diaphragm. The outer ends of these projections are folded inwardly,

and clasped in each end is a flat yielding connection 23, of metal or other material, and preferably resilient, whereby the stylus bar is supported upon the casing of the box, these connections being secured rigidly to the extensions of the bar by sweating, or any other suitable process. Although I prefer to use thin flat tempered steel springs for these connections 23 supporting the stylus bar, yet I do not limit myself to this particular kind of material, as I have found that a very good reproduction of sound may be obtained when soft copper cylindrical wires are used instead of the steel spring, thus showing that any yielding connection, whether resilient or not, will produce good results when used in this form of stylus bar.

The inner ends of the yielding connections rest upon a flattened surface 24 of the side of the sound box casing. This flattened surface is provided with a semi-circular recess 25 for the reception of the inner half of the inner end of the cylindrical portion of the stylus bar so as to permit the bar to vibrate without touching against the casing. The yielding connections supporting the bar are held in place upon this flat surface by means of the plate 26 which is secured over the connections by means of the screws 27 passing through the plate and into the sound box casing, the inner edge of the plate being provided with a rib 28 substantially equal in thickness to the thickness of the connections, the inner surface of the rib resting upon the flattened surface of the box, so that the inner surface of the plate will remain parallel with the flattened surface of the box and will tightly hold the inner ends of the connections against the flattened surface of the casing.

The arrangement of the stylus bar with respect to the sound box casing is such that the longitudinal axis of the stylus bar socket and the axis of oscillation of the stylus bar are substantially in the plane of the diaphragm, consequently the vibrations of the upper end of the stylus bar connected to the diaphragm will be in a line normal to the diaphragm, and will have, therefore, no tendency to buckle the diaphragm, as would be the case were the axis of oscillation of the bar not in the plane of the diaphragm.

With this construction in mind, it is evident that I have provided a sound box of simple, durable construction, in which the parts are readily removable, and in which the stylus is so constructed and arranged as to reproduce with extreme sensitiveness, and with great faithfulness, the sound waves traced upon the record.

While I have shown this invention only as embodied in a single form, yet it is obvious that various modifications might be made in the form and construction of this device within the scope of the appended claims,

without departing from the spirit of this invention or sacrificing any of the advantages thereof.

Having thus fully described my invention, what I claim and desire to protect by Letters Patent is:

1. In a sound box, the combination with a casing comprising two separate parts forming an annular internal groove, of a diaphragm, and an annular mounting for said diaphragm in said groove, said mounting being substantially rectangular in cross section and being equal in width and diameter to the width and diameter of said groove.

2. In a sound box, the combination with a casing, of a yielding tubular extension secured to the rear side thereof, and provided with an internal annular recess and a non-yielding lining in said recess.

3. In a sound box, the combination with a casing, of a yielding tubular extension secured to the rear side of said casing, and a non-yielding lining in said recess, the inner edge of said lining being in contact with the rear side of said casing.

4. In a sound box, the combination with a casing, of a yielding tubular extension secured to the rear side of the said casing, and a non-yielding lining within said extension, the rear edge of said lining being spaced inwardly from the rear edge of said extension.

5. In a sound box, the combination with a casing, of a yielding tubular extension secured to the rear side of the said casing, and a non-yielding lining within said extension, the rear edge of said lining being spaced inwardly from the rear edge of said extension, and the inner surface of said lining being flush with the inner surface of the portion of the yielding extension which is in the rear of the rear edge of said lining.

6. In a sound box, the combination with a casing, of a yielding tubular extension secured to the rear side of said casing, and a non-yielding lining within said extension, the inner edge of said lining being in contact with the rear side of said casing and the rear edge of the said lining being spaced inwardly from the rear edge of the said extension.

7. In a sound box, the combination with a casing, of a yielding tubular extension secured to the rear side of the said casing and having a reduced outer end and non-yielding lining for said extension spaced inwardly from the outer edge of said reduced end, the inner surface of said reduced end and said lining being substantially flush.

8. In a sound box, the combination with a casing, of a yielding tubular extension secured to the rear side of the casing and having its outer end reduced in outside diameter.

9. In a sound box, the combination with a casing, of a yielding tubular extension secured to the rear side of the casing and having its outer end reduced in outside diameter, and a non-yielding lining covering part of the inner surface of said extension, the inner surface of said lining being flush with the inner surface of the outer end of said extension.

10. In a sound box, the combination with a flat annular plate provided with a rearwardly extending flange at its periphery terminating in an outwardly extending flat flange, of a cap secured over the periphery of said plate and in the space between said flanges, a yielding tubular extension secured to the rear side of said annular plate concentric therewith and provided with an internal annular recess, and a non-yielding lining in said tubular extension.

11. In a sound box, a stylus bar provided with lateral extensions terminating in folded ends and yielding supports for said bar secured in the folds of said extensions.

12. In a sound box, a stylus bar, lateral extensions upon said bar terminated in folded ends and resilient supports for said bar secured in the folds of said ends.

13. In a sound box, a stylus bar comprising an inner portion, an outer portion offset from said inner portion, an intermediate portion connecting said inner and outer portions, said intermediate portion being provided with lateral extensions terminating in folded ends, and yielding supports for said stylus bar secured between the folds of said ends.

14. In a sound box, a stylus bar comprising an inner flat tapering portion, an outer cylindrical portion provided axially with a stylus socket and an intermediate portion connecting said inner and outer portions, said intermediate portion having a side turned inwardly and slotted to receive the outer end of said inner portion.

15. In a sound box, a stylus bar comprising an inner portion, an outer portion and an intermediate portion, said outer portion being off-set from said inner portion and said intermediate portion being provided with an up-turned slotted portion to receive the outer end of said inner portion and with an aperture to receive the inner end of said outer portion.

16. In a sound box, a stylus bar comprising an inner portion, an outer portion, and an intermediate portion, said outer portion being offset from said inner portion, the central part of said intermediate portion being substantially flat, and being provided with oppositely extending lateral projections terminating in folded ends, and yielding supports for said stylus bar secured between the folds of said ends.

17. In a sound box, a stylus bar comprising

an inner portion, a cylindrical outer portion provided with a stylus socket, and an intermediate portion, said intermediate portion having a substantially flat central portion of semi-circular shape upon one side conforming to the cylindrical lower portion of the bar, and being provided on its opposite side with a bent slotted projection to receive the end of the inner portion of said bar, said intermediate portion being further provided with oppositely extending lateral projections terminating in folded ends, and yielding supports for said bar secured between the folds of said ends.

18. In a sound box, the combination with a casing having a flattened side, of a stylus bar, a yielding support for said bar, one end of said support resting upon the said flattened side, a plate resting upon the outer surface of said yielding support, and means to force said plate upon said yielding support to hold the same against said sound box casing, said plate being provided on one edge with a rib of substantially the same thickness as the thickness of the end of said yielding support, whereby the inner surface of the plate is retained in a plane parallel to the flattened surface of the sound box casing.

19. In a sound box, the combination with a casing having a flattened side provided with a semi-circular recess, of a stylus bar having a cylindrical outer end offset from the inner end of said bar, said outer end projecting into said semi-circular recess but being spaced from the surface thereof, spaced yielding supports for said stylus bar, the inner ends of said yielding supports resting respectively upon the flat side of said sound box casing upon opposite sides of the semi-circular recess, a flat plate provided with a semi-circular recess on one edge, and with a rib upon the opposite edge, and means for holding said flat plate against said sound box casing, and against the ends of said yielding supports to retain said yielding supports in position.

20. In a sound box, the combination with an annular plate provided with a rearwardly extending flange forming a recess in the rear face of the box, of a yielding tubular extension secured in said recess.

21. In a sound box, a stylus bar comprising an inner portion and an outer portion offset therefrom, and an intermediate portion of substantially uniform thickness connecting said inner and outer portions, said intermediate portion having one side turned away from the plane of the other side and slotted to receive the end of one of said other portions.

22. A stylus bar comprising an inner portion and an outer portion offset therefrom, and an intermediate portion, said intermediate portion having one side turned away

from the plane of the other side and slotted to receive one end of one of said first mentioned portions, and having its other side apertured to receive one end of the other of said first mentioned portions.

23. A stylus bar comprising two portions offset from each other, and an intermediate portion connecting said first mentioned portions, said intermediate portion having one side substantially oblique to one of said offset portions.

24. A stylus bar comprising two portions offset from each other, and a plate connecting said portions, said plate having one side substantially oblique to one of said portions, and being slotted to receive the same.

25. A stylus bar comprising two portions off-set from each other, and a plate connecting said portions, said plate having one side substantially oblique to one of said portions.

26. In a sound box, a stylus bar comprising an inner portion, an outer portion and an intermediate portion, said inner portion being provided upon one side with a bent and

slotted projection to receive the end of the inner portion of said bar.

27. In a sound box, a stylus bar comprising an inner portion, an outer portion provided with a stylus socket and an intermediate portion connecting said inner and outer portions, said intermediate portion having a side turned inwardly to receive the outer end of said inner portion.

28. In a sound box, a stylus bar comprising two portions, and an intermediate portion, said intermediate portion having one side bent and slotted to receive one end of one of said first mentioned portions.

29. In a sound box, the combination with a casing, of a yielding tubular extension therefor, and a non-yielding lining for said extension, said lining having a smooth cylindrical external surface.

GEORGE L. COLEMAN

Witnesses:

ALSTON B. MOULTON,

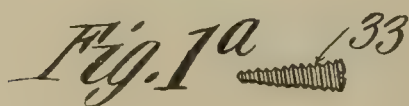
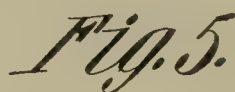
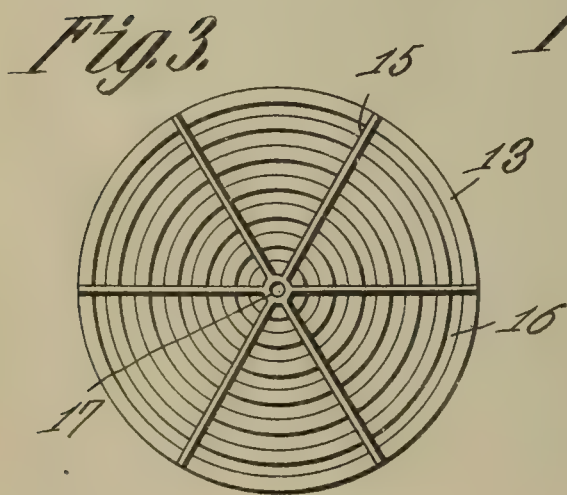
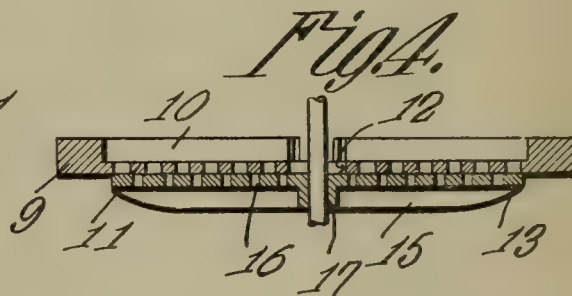
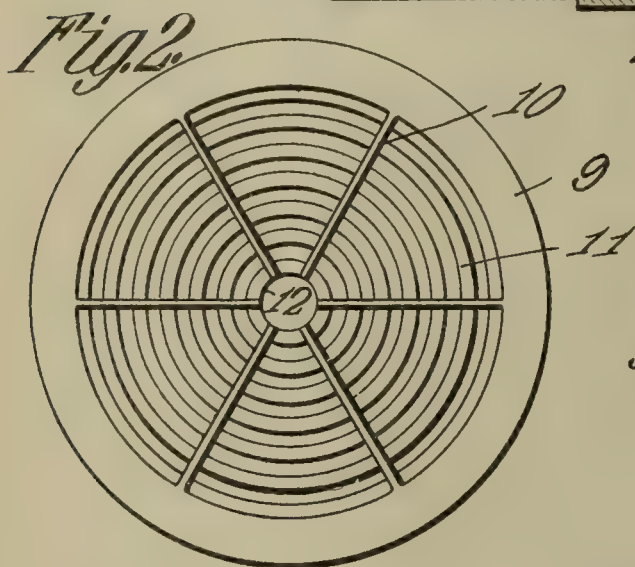
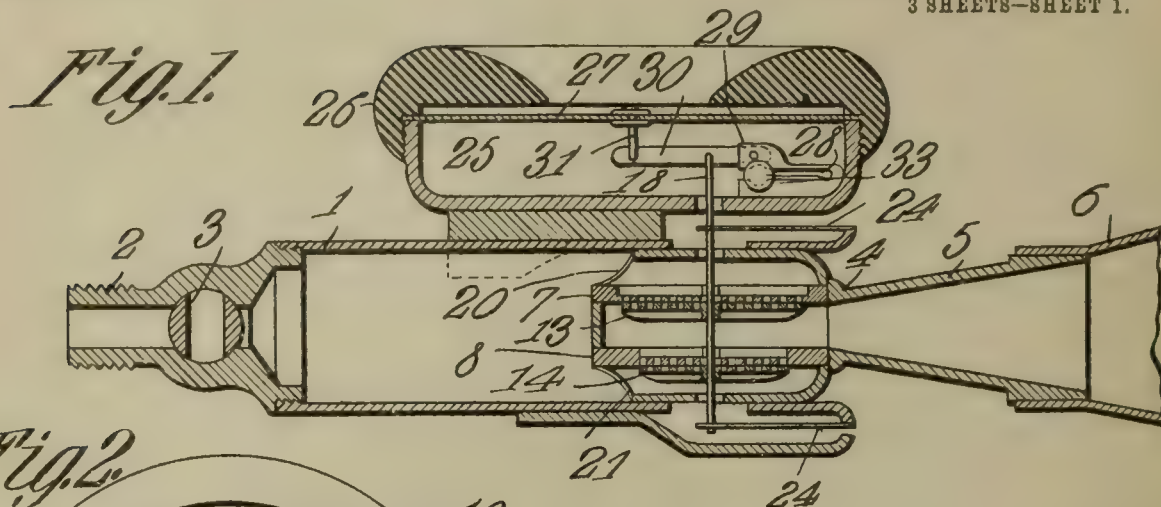
ALEXANDER PARK.

N. BALDWIN.
SOUND AMPLIFIER.
APPLICATION FILED AUG. 29, 1908.

946,096.

Patented Jan. 11, 1910.

3 SHEETS—SHEET 1.



Witnesses

E. J. Stewart
Jno. E. Parker

Inventor
Nathaniel Baldwin

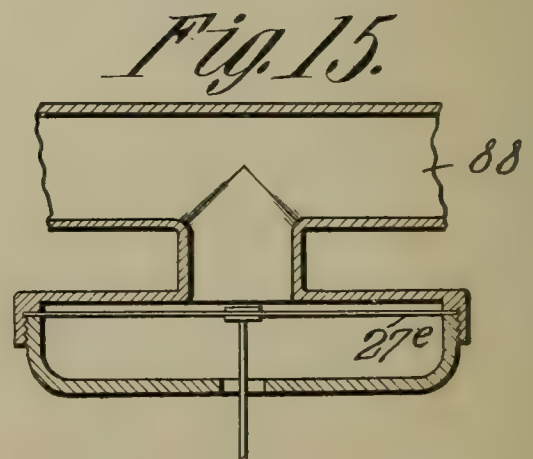
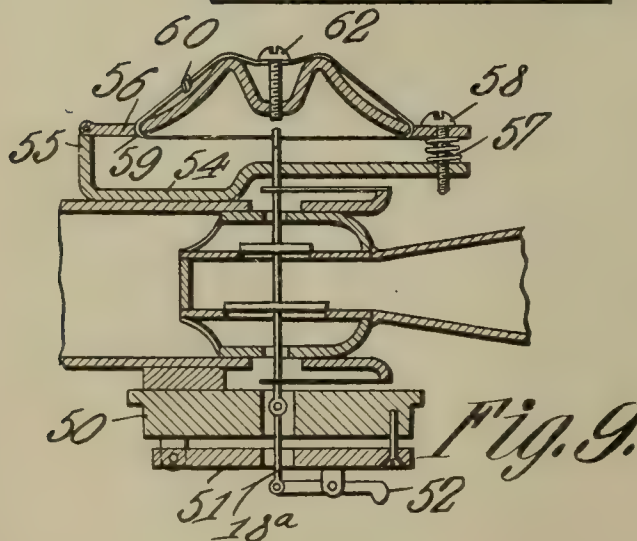
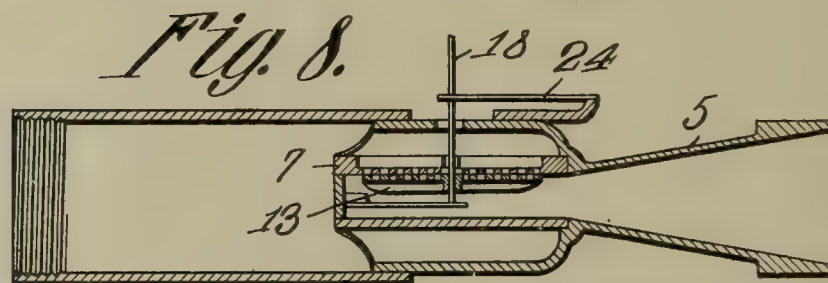
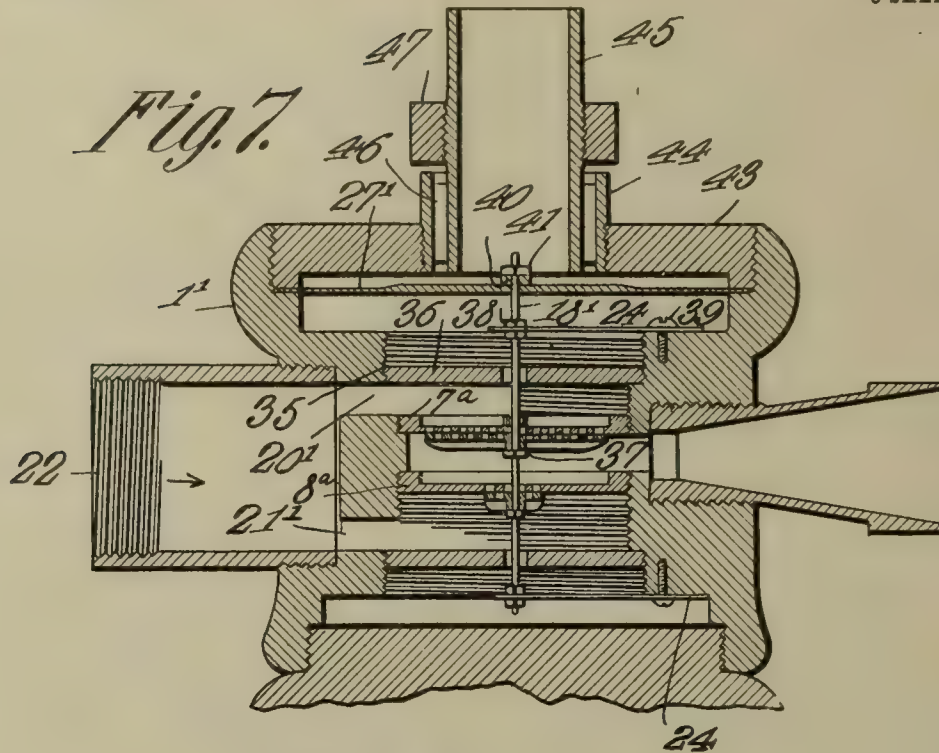
By *C. A. Snow & Co.*
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SOUND AMPLIFIER.
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3 SHEETS—SHEET 2.



Witnesses

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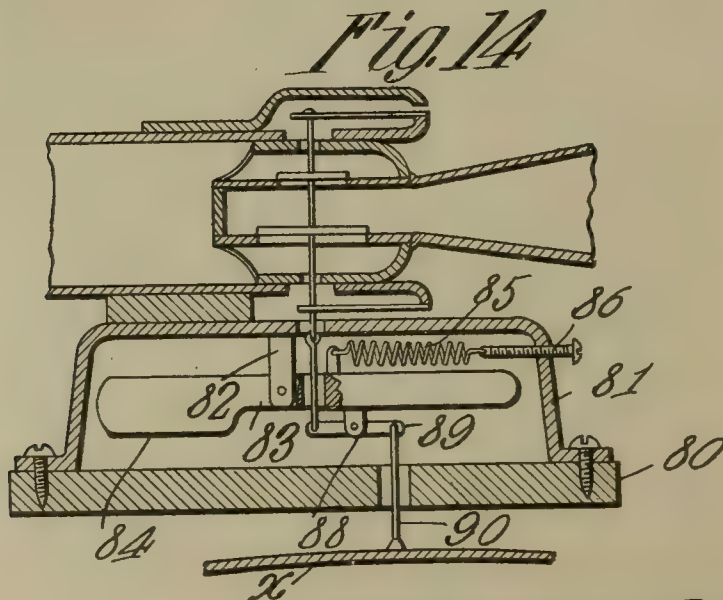
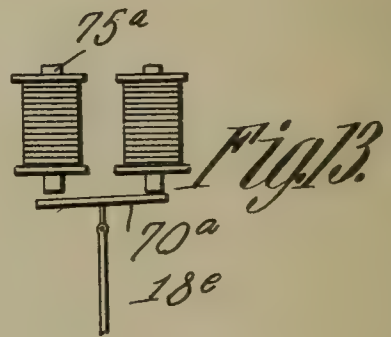
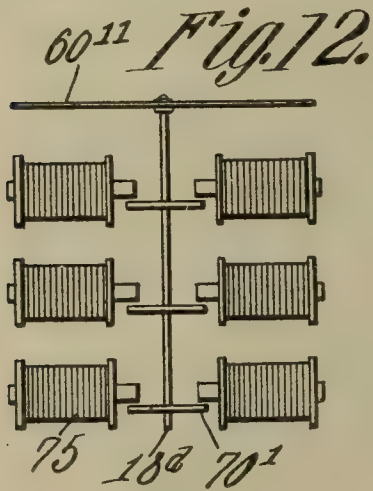
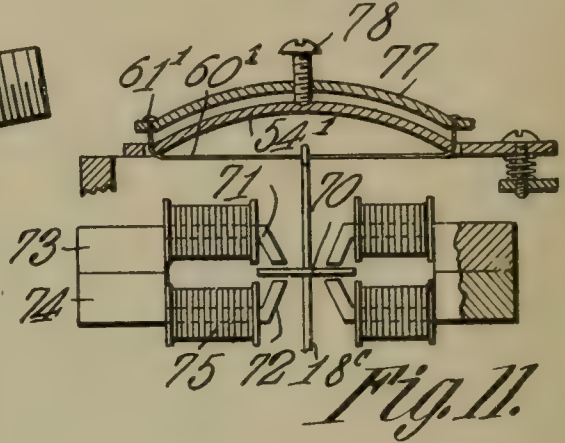
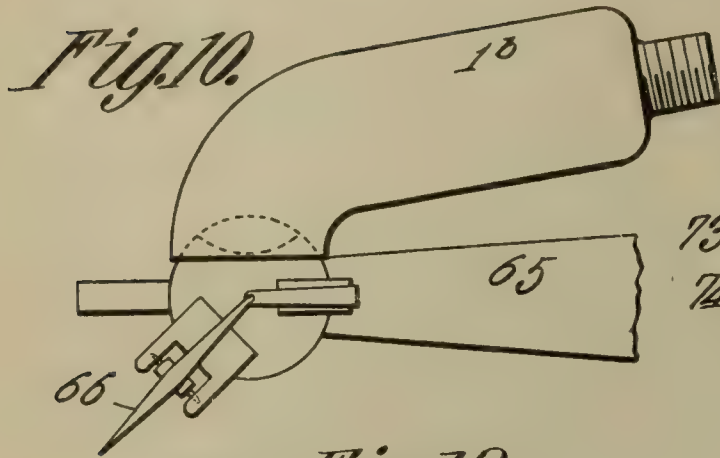
By *C. A. Snow & Co.*
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N. BALDWIN.
SOUND AMPLIFIER.
APPLICATION FILED AUG. 29, 1908.

946,096.

Patented Jan. 11, 1910.

3 SHEETS—SHEET 3.



Witnesses

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UNITED STATES PATENT OFFICE.

NATHANIEL BALDWIN, OF MIDWAY, UTAH.

SOUND-AMPLIFIER.

946,096.

Specification of Letters Patent.

Patented Jan. 11, 1910.

Application filed August 29, 1908. Serial No. 450,798.

To all whom it may concern:

Be it known that I, NATHANIEL BALDWIN, a citizen of the United States, residing at Midway, in the county of Wasatch and State of Utah, have invented a new and useful Sound-Amplifier, of which the following is a specification.

This invention relates to sound amplifiers of that general type illustrated in Letters-Patent of the United States granted to me on October 29, 1907, No. 869,288.

The principal object of the present invention is to improve and simplify the operation of the device and to provide for the more delicate balancing of the controlling valves, so that they may be made more quickly responsive to the vibrations of the diaphragm, armature, or other device to which they are connected.

A further object of the invention is to provide improved means for connecting the diaphragm or other vibrating body to the valve rod for the purpose of securing increased force in the operation of the valve and further to permit of greater delicacy of adjustment.

A still further object of the invention is to arrange the opposing valves which are subjected to the pressure of air, steam, or other actuating fluid, so that one shall present a greater surface area than the other and the pressure operating on the excess area will tend to move both valves to open position, and, further, to provide for counter-balancing of this extra pressure by connecting with the operating device, so that the elasticity of the diaphragm, magnetic force operating through an armature, or the energy of a spring or weight, may be utilized in part as a valve closing means.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:—Figure 1 is a sectional elevation of a sound amplifier constructed in accordance with the invention, the instrument here shown being

one which is used in speaking or singing when the instrument can be placed close to the mouth. Fig. 1^a is a detail view. Fig. 2 is a plan view of one of the valve seats drawn to an enlarged scale. Fig. 3 is a similar view of one of the valves. Fig. 4 is a cross sectional view of a valve and its seat on an enlarged scale. Fig. 5 illustrates a modified construction of seat, and Fig. 6 a modified construction of valve that may be employed. Fig. 7 is a sectional elevation illustrating a slightly modified construction that is adapted more especially for use as a secondary instrument and may be used to control the flow of a stream of steam to the amplifying horn. Fig. 8 illustrates a construction in which only a single valve is employed, the valve being so arranged that the fluid under pressure tends to open it while its force is counter-balanced by a mechanical means. Fig. 9 is a sectional elevation illustrating a structure that may be employed in connection with a sound reproducing machine of the cylinder record type. Fig. 10 is an elevation showing the arrangement followed when adapting the device for use in connection with a machine of the disk record type. Fig. 11 illustrates a valve operating mechanism in the form of an armature located between the pole pieces of a telephone receiver. Fig. 12 illustrates a further construction in which the valve rod carries a series of armatures connected in tandem. Fig. 13 illustrates a further modification of the electromagnetically operated valve rod. Fig. 14 is a sectional elevation illustrating the use of the device in connection with a musical instrument having a sounding board, the sound waves being mechanically transmitted through the valves for the purpose of controlling the flow of the stream of fluid to the amplifying horn. Fig. 15 is a sectional elevation showing the manner in which the device may be connected to a wind instrument where the sounding column of air operates on a diaphragm that transmits movement to the valve rod.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

In the construction shown in Fig. 1, the main casing 1 is provided at one end with a nipple 2 for connection to a supply of fluid under pressure, and in the nipple is a controlling valve 3 of any suitable construction. The opposite end of the casing receives a

small casing 1 from the central end portion of which projects a neck 5 for the support of the amplifying horn 6. The chamber 4 is divided into three superposed compartments by a pair of valve seats 7 and 8, the construction of the valve seats being more clearly shown in Figs. 2 and 4. Each seat is formed of stamped sheet metal in the form of a disk having a marginal flange 9, and a series of radially disposed ribs 10, the flange and the ribs being formed integral with the central solid plate of the disk. This disk is preferably placed in a lathe, and cut to form a series of concentric slots 11 and a central opening 12, the slots 11 extending entirely through the plate, while the central opening extends through both the plate and the ribs 10, in order to form a free passage way for the valve rod. The ribs will then serve to hold the rings of metal between the concentric ports in proper position. The valves 13 and 14 are of similar construction, being each formed of a plate of metal having radial ribs 15 and the plate is placed in a lathe and provided with a series of concentric slots 16 that extend entirely through the plate, so that the intervening ribs of metal are held in proper position by the radial ribs. The hub from which all of the ribs radiate is then provided with a central opening 17 for the passage of the valve rod 18. In practice, the metallic rings which constitute the valve are a little wider than the concentric ports in the valve seat, so that when the valve is in closed position there is a slight lap, usually not more than one five hundredth of an inch and it will require but very slight movement of the valve to permit the passage of the current of air or steam while at the same time the flow of the stream of fluid between the seat and valve will not tend to move the latter beyond the initial position. A stream of air passing through the casing 1 enters into the upper compartment through a port 20, and into the lower compartment through a port 21, so that the upper valve 13 is exposed to downward pressure, and the lower valve 14 to upward pressure. The valves are so constructed that the one which the fluid under pressure tends to open, the upper one in Fig. 1, presents a larger surface area to the pressure than the one which the air pressure tends to close. There is thus produced an excess pressure that tends to open the valves, and this is counter-balanced in the manner hereinafter described by the elasticity of a diaphragm, or spring, by a weight or by magnetic force. The valve rod is slightly supported by a pair of small springs 24 which are secured at one end to arms projected from the top and bottom of chamber 4, and the upper end of the rod extends into the diaphragm box for connection to the diaphragm. The diaphragm box or casing 25 is threaded for the

reception of a mouth piece 26, and between the flanged edge of the member 25 and the mouth piece is clamped a diaphragm 27 formed of any suitable material. Secured at one end to the wall of the box 25 is a spring 28 having an enlarged head 29, to which is fulcrumed one end of a lever 30, the opposite end of the lever being connected to the diaphragm by a link 31. To this lever is connected the upper end of the valve rod 18, the connection being preferably made at a point close to the fulcrum of the lever, so that the valve operating force may be increased. The free end of the spring support 28 rests on a tapered screw 33 which may be turned for adjusting the stress of the spring and raising or lowering the fulcrum point of the lever. (See Fig. 1^a). The spring acts merely to force the fulcrum down into firm engagement with the supporting and adjusting screw 33.

When the two valves are subjected to the pressure of the fluid from casing 1, the superior area of the upper valve tends to move both valves to open position and if the upward force exerted by the connection with the diaphragm including the elasticity of the diaphragm proper is sufficient to counter-balance this extra pressure area, the valves will remain closed. If the valves are not exactly balanced, a turn of the screw 33 in one direction or the other is all that is necessary to effect the proper adjustment and such an adjustment may be made with greater ease and more delicacy than is possible where the valves have practically the same pressure area, as in the latter case by the time they are adjusted to open far enough for the best results, from one-tenthousandth to three-ten-thousandths of an inch, they become somewhat unstable and difficult to keep in adjustment. For some purposes it may be preferred to have this excess pressure very slight, or, for other purposes, it may be desirable to have it greater, so the smaller valve may be made short one ring, two rings, or in extreme cases all of them, and the central cap may be omitted. It then becomes a single valve and takes the form illustrated in Fig. 8, wherein the valve is subjected to pressure only in one direction, and this pressure is counter-balanced, or partly counter-balanced by strictly mechanical forces, or by electro-magnetical means for the purpose of securing the desired delicacy of adjustment.

While the valves are described and preferably consist of concentric annular rings and ports, they may be made to assume a great variety of shapes all embodying the same principle. For example, the seats and valves may take the form of a grating, as illustrated at 7' and 13' in Figs. 5 and 6.

In Fig. 7 is shown an instrument operated on the same general principles, but of

slightly different design in construction. It is especially valuable as a secondary instrument, and may be used with steam instead of air. The body portion comprises
 5 a casting 1' into which the various parts are threaded. The two seats 7^a and 8^a are screwed down against shoulders formed in the body portion, and above the threaded seat receiving recesses are threaded open-
 10 ings 35 in which are screwed cap pieces 36, so that when the caps are removed, the seats may be taken out. The valves are threaded on to the valve rod 18' and set with jam nuts 37, and the valve rod carrying springs
 15 24 are also clamped into the rod between the nuts 38, while the outer ends of the springs have their ends secured to the body of the casing by screws 39. The supply-pipe 22 is
 20 of the casing to supply the steam, or other fluid, and the fluid passing through suitable ports 20' and 21' to points above and below the valves. The neck of the horn is, also, threaded, and screwed into a threaded open-
 25 ings at a point opposite the supply pipe 22. The valve rod 18' passes through an opening formed in the diaphragm 27', and the valves are adjusted by a nut 40 which is locked in place by a jam nut 41. This manner of ad-
 30 justment may, also, be serviceable in connection with the instrument shown in Fig. 1.

In the construction shown in Fig. 7, the edge of the diaphragm rests on a shoulder formed at the base of a threaded recess at
 35 the top of the casing, and is clamped in place by a disk 43 that is provided with a threaded opening for the reception of a sleeve 44. Fitting into the sleeve is a tube 45 which, when the device is used as a sec-
 40 ondary instrument, may be connected directly to the neck 5 of the primary instrument, so that the sound waves from the latter will be directed through the tube 45 against the diaphragm. The tube 45 is of
 45 much smaller diameter than the sleeve 44, and is held in central position by small spacing ribs 46 and the exterior of the tube 45 is threaded to receive a ring valve 47 which may be adjusted to restrict the escape of air
 50 from the sleeve 44, so as to obtain the maximum effect of the air pulsations from the primary instrument. By causing the augmented sound waves from one instrument to
 55 operate the sound waves of the other instrument in this way, spoken words may be augmented to such an extent as to replace steam whistles, bells, gongs, or other sound signals.

While the instrument shown in Fig. 7 is especially adapted for a secondary instru-
 60 ment, it may be made sufficiently small and delicate to operate as a primary instrument, in which case a different form of diaphragm clamping and sound wave transmitting means may be employed. The construction
 65 of the regulating device for controlling the

escape of air from the sound box may, also, be used in connection with any form of primary instrument to operate a phonograph recorder in which case the diaphragm of the recorder would take the place of the dia-
 70 phragm 27', or in the operation of a telephone transmitter, in which case the diaphragm of the transmitter would take the place of the diaphragm 27', or it might be used in connection with a telephone relay,
 75 in which case the transmitter diaphragm would take the place of the diaphragm 27', and the primary valve would be operated by telephone currents in the manner herein-
 80 after described.

It is, of course, possible in connection with either of the instruments shown in Figs. 1 or 7 to replace the diaphragm by the dia-
 phragm of a telephone receiver, or to the armature operated by telephonic currents,
 85 and in such case the valve will be operated by the impulse and the stream of fluid will flow through the valve ports to the amplifying horn, so that in this way it is possible to speak, sing or play music to be trans-
 90 mitted telephonically and intensified at the receiving end of the line, so as to be heard by large audiences.

Fig. 9 represents the instrument arranged for use as a reproducer for cylinder record
 95 phonograph machines. In this case the valves are represented diagrammatically, and not in detail. At the lower portion of the attachment is a disk 50 that fits within the usual socket in the reproducer carriage
 100 and to this is pivoted the weight lever 51 carrying the reproducer stylus 52. The stylus is connected to the lower end of the valve rod 18^a, and in this case the arrangement of the valves shown in Fig. 1 is re-
 105 versed, that is to say, the larger valve is at the bottom and the smaller valve at the top, so that the excess pressure tending to open the valve operated in an upward direction and thus tends to thrust the stylus into the
 110 record. This pressure is to a certain extent counter-balanced by the weight lever 51. Above the main casing is arranged a bracket 54 having an upwardly directed arm 55 on which is pivoted a lever 56. The opposite
 115 end of the lever is normally elevated by a compression spring 57 that is coiled around an adjusting screw 58 passing through an opening in the lever and threaded into an opening in the bracket 54. By turning this
 120 screw, the free end of the lever may be forced downward, or on turning in the opposite direction the spring will be allowed to slightly raise the lever. The lever is provided with a pair of openings 59 through
 125 which extends a wire 60, the ends of the wire passing over the corrugated back of the lever and being connected together so as to form a continuous loop. The upper end of the valve rod is connected to the lower ply of
 130

the loop, and the upper ply extends under the head of a screw 62 that passes through a threaded opening formed in the depressed central portion of the lever. By turning this screw the loop of wire may be stretched taut to a greater or less extent and the valve rod may thus be raised or lowered in order to secure the delicate adjustment necessary to proper operation. In employing the structure shown in Fig. 9, if the force exerted by the weight lever 51 is sufficient to accurately balance the excess of air pressure on the lower valve, the wire adjusting wire may be omitted.

Fig. 10 represents the instrument in use as a reproducer for disk record phonographs. In this case the valve casing is connected directly to the movable arm 65 of the horn, and the main chamber 1^b instead of being connected opposite to the horn connection, is disposed at a right angle thereto, and then bent forward in the direction of the horn, so that the hose carrying the air or other fluid under pressure may be connected or fastened near the joint of the horn in such manner that it will exert no force upon the reproducer. The valve rod in this case is arranged horizontally with its front end connected to the usual lever 66 which carries the needle. Any suitable form of adjusting device or counter-balancing mechanism may be employed in this connection, and it has not been considered necessary to illustrate this in detail.

In Fig. 11 is illustrated a construction in which the valve rod is operated by the electro-magnets of a telephone receiver. In this case the armature 70 is arranged between the polar extensions 71 and 72 of the pole pieces, the latter being made in two parts 73 and 74, so that the coils may be readily wound upon the spools 75. The free ends of the legs of adjacent pole pieces are of the same polarity, and these pole pieces straddling the armature 70 exert upon the latter a substantially equal magnetic pull on each side. The coils are connected in the usual manner in the telephone circuit and the armature is connected directly to the valve rod 18^c. In this figure is represented a slight modification of the adjusting device. The cross bar or lever 54' is provided with openings for the passage of a wire 60' and the latter has an enlarged head 61' which prevents the wire pulling through an extra cross piece 77 that is arranged above the lever. The cross piece has an opening for the passage of a screw 78 which bears against the central portion of the lever and by adjusting this screw the tension on the wire may be increased or diminished for the purpose of adjusting the valve rod.

In the construction shown in Fig. 12, the valve rod 18^d is connected to a plurality of armatures 70' arranged tandem, and adapted

to be operated on by a corresponding number of electro-magnets 75. In this case a portion of the adjusting wire 60'' is shown, or any other form of adjusting mechanism may be employed, as desired. In some cases two or more armatures as shown in Fig. 11 with their pole pieces, may be arranged tandem as in Fig. 12.

Fig. 13 illustrates a still further modification. In this case the valve rod 18^e is connected to an armature 70^a that is acted upon by an electromagnet 75^a.

Fig. 14 illustrates the application of the device to a musical instrument having a sound board. The arrangement is in some respects the same as that for the phonograph. On a suitable supporting means or plate 80 adjacent the sound board is arranged a casing 81 that serves as a support for the valve chamber and the main casing with its air supply and amplifying horn connections. Arranged within the casing is a hanger 82 on which is pivoted a lever 83 having at one end a heavy counter-balance weight 84, and connected to the opposite end of the lever is a spring 85, the outer end of which is swiveled to an adjusting screw 86 that extends through a threaded opening in the wall of the casing. Depending from the lighter arm of the lever is a bracket 88 to which is pivoted a lever 89, and one end of this lever is connected to the lower end of the valve rod. To the opposite end of the valve rod is connected a sound-wave transmitting rod 90 having a blunt point which rests on the sound board X of the instrument and communicates its motion through the lever system to the valves. The inertia lever 83 is balanced with reference to its fulcrum, so that the valve will be under the same stress for all positions of the musical instrument. The downward pressure is produced by the coiled spring 85, and its stress may be adjusted by the screw 86.

In Fig. 15 is shown the connection for wind instruments. In this case 88 represents the sounding air column, such as the tube leading to the horn or bell of a brass instrument, and 27^e indicates the diaphragm to which movement is transmitted by the sound waves, this diaphragm being connected to the controlling valve or valves in any suitable manner.

The amplifier provided with some telephonic receiving apparatus such as represented in Figs. 11, 12 or 13, may take the place of the ordinary receiver on the telegraphophone, thus combining the purity and distinctness of reproduction of the telegraphophone with as great sound volume as may be desired.

What is claimed is:—

1. In a sound amplifier of the class described, a rod having a valve secured thereto and exposed to the pressure of the actuating

fluid, means for operating said valve, and an adjustable means operatively connected with the valve rod for counter-balancing the pressure on the valve.

5 2. In a sound amplifier of the class described, a valve exposed to the pressure of the actuating fluid and provided with a depending rod, means for actuating the valve, and an adjustable mechanical means opera-
10 tively connected with the valve rod for counter-balancing the pressure on the valve.

3. In a sound amplifier of the class described, a pair of valves exposed to the pressure of the actuating fluid, and operating
15 thereon in opposite directions, respectively, one of said valves being of greater area than the other, and means for counter-balancing the pressure on the excess area of the larger valve.

20 4. In a sound amplifier of the class described, a pair of valves of unequal area exposed to the pressure of the actuating fluid, said pressure tending to move one valve to open position and the other to closed position, and means for counter-balancing the
25 effect of the pressure on the excess area of the larger valve.

5. In a sound amplifier of the class described, a pair of valves of unequal area exposed to the pressure of the actuating fluid, such pressure tending to move the larger
30 valve to open position and the smaller valve to closed position, and means for counter-balancing the effect of the pressure on the excess area of the larger valve.
35

6. In a sound amplifier of the class described, a pair of valves of unequal area exposed to the pressure of the actuating fluid,

such pressure tending to move the larger valve to open position and the smaller valve
40 to closed position, and an adjustable mechanical means for counter-balancing the effect of the pressure on the excess area of the larger valve.

7. In apparatus of the class described, a
45 duct leading from the source of pressure supply to the amplifying horn, a valve in said duct, a rod carrying the valve, a valve rod actuating means, connected with the opposite end of the rod and means connected
50 with the opposite end of the rod and operating through said rod to adjust the valve to compensate for pressure of the fluid thereon.

8. In apparatus of the class described, a
55 duct leading from a source of pressure supply to the amplifying horn, a valve in said duct, a rod carrying the valve, a spring pressed lever to which the rod is connected, means for adjusting the fulcrum of the
60 lever, and means for vibrating said lever.

9. In apparatus of the class described, a duct leading from a source of pressure supply to the amplifying horn, a valve in
said duct, a rod carrying the valve, a lever,
65 a spring support forming a fulcrum for the lever, an adjusting screw under said support, a diaphragm, and means for connecting the lever to the diaphragm.

In testimony that I claim the foregoing as
70 my own, I have hereto affixed my signature in the presence of two witnesses.

NATHANIEL BALDWIN.

Witnesses:

HENRY WATKINS,

FREDRICK SONDEREGGER.



A. E. MADISON.
CABINET FOR SOUND REPRODUCING MACHINES.
APPLICATION FILED NOV. 10, 1908.

Patented Jan. 11, 1910.
2 SHEETS—SHEET 1.

946,243.

Fig 1.

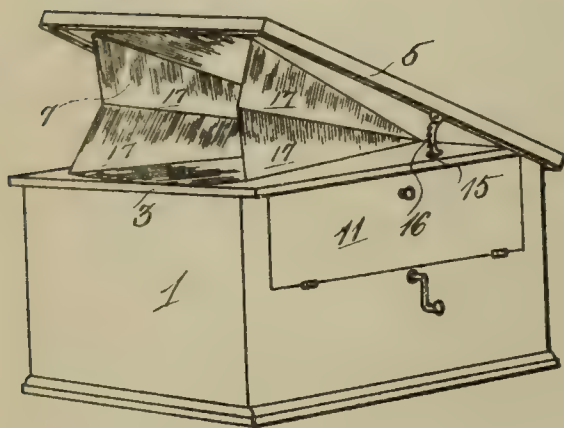


Fig 2.

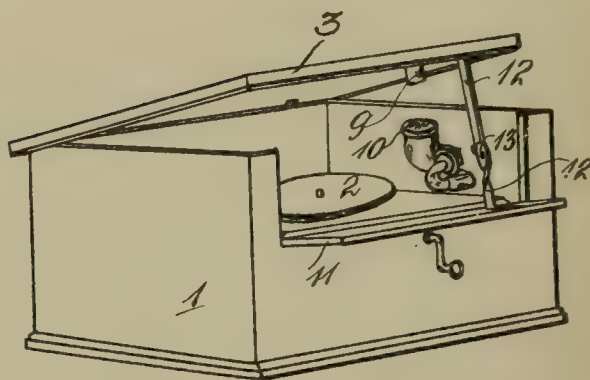


Fig 3.

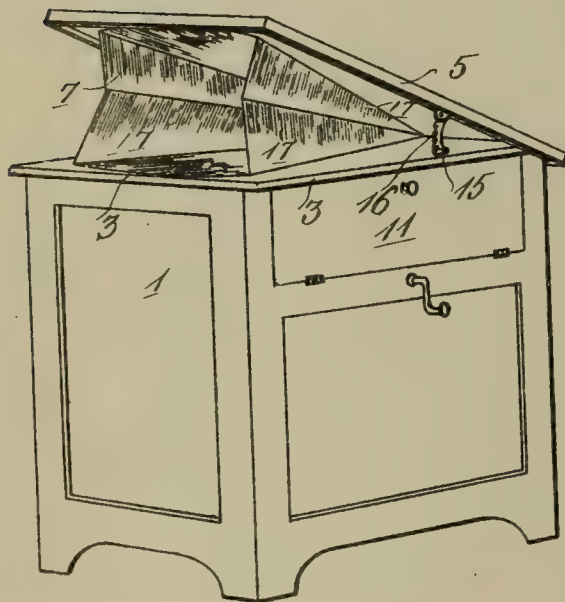
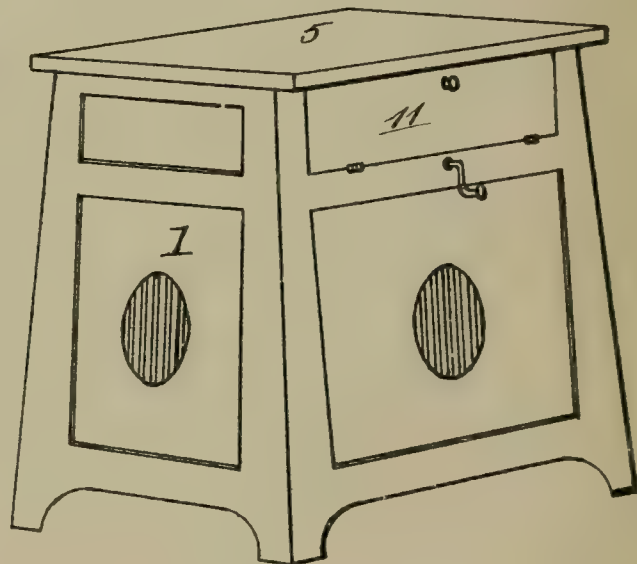


Fig 4.

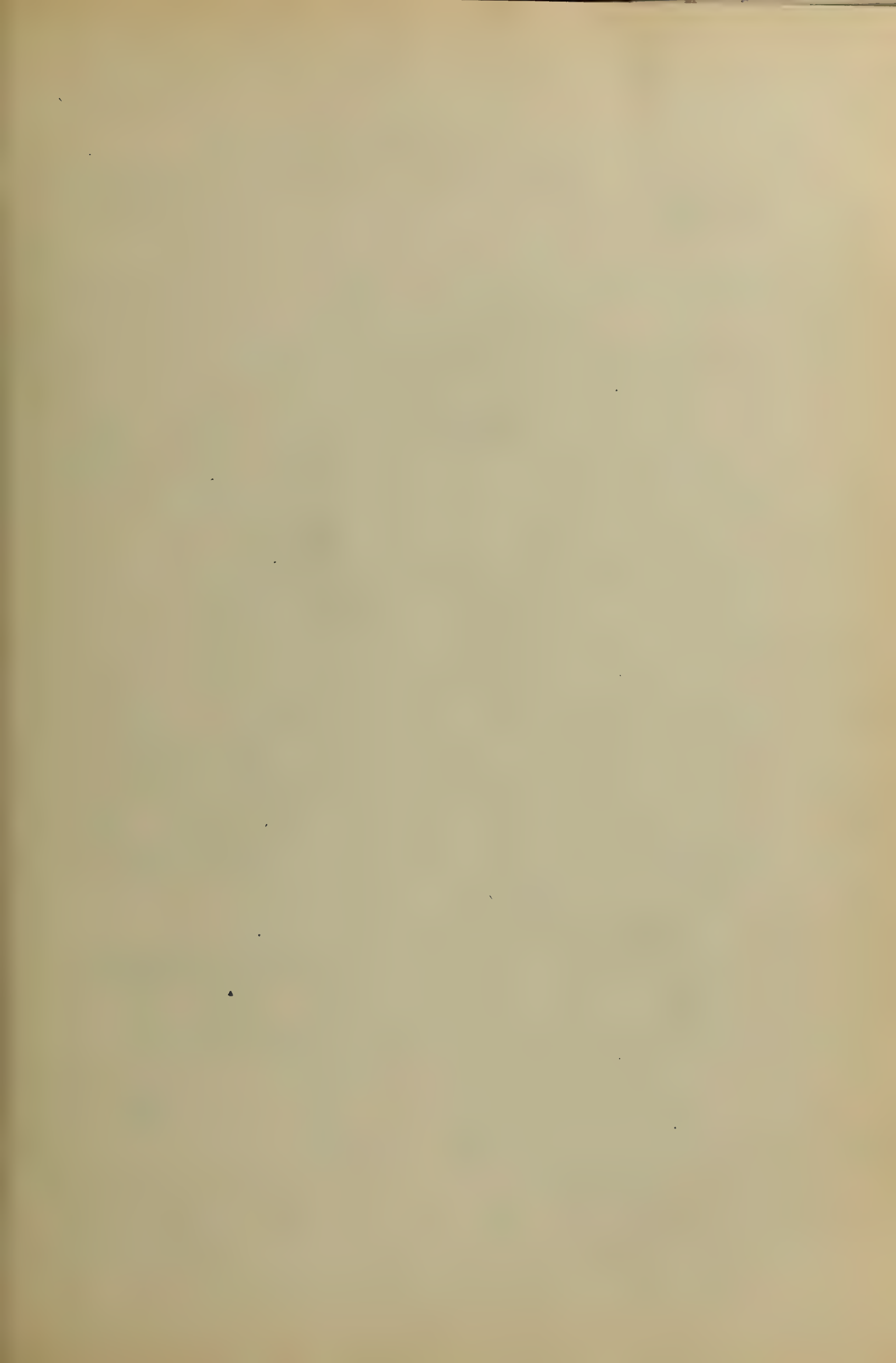


WITNESSES.

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A. E. MADISON.
CABINET FOR SOUND REPRODUCING MACHINES.
APPLICATION FILED NOV. 10, 1908.

946,243.

Patented Jan. 11, 1910.

2 SHEETS—SHEET 2.

Fig 5.

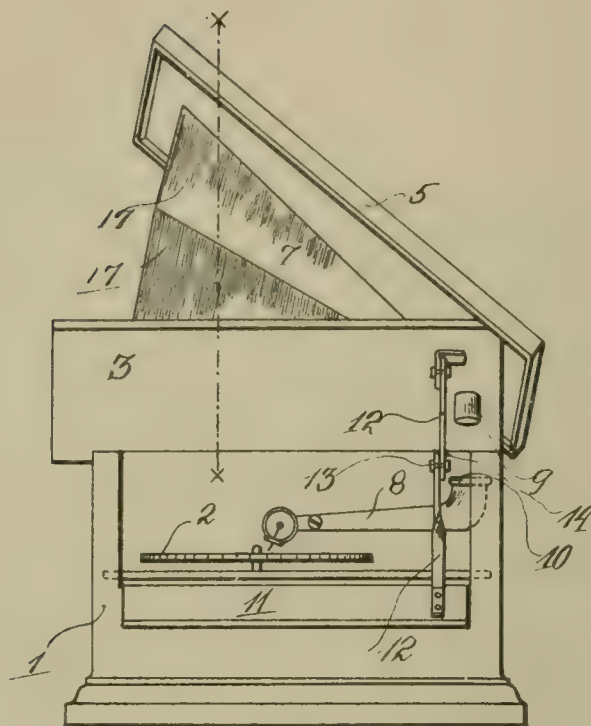


Fig 6.

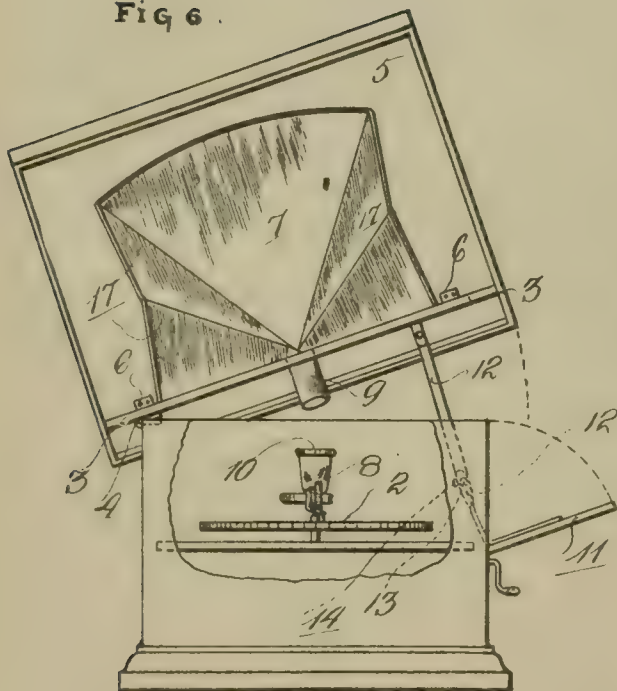


Fig 7.

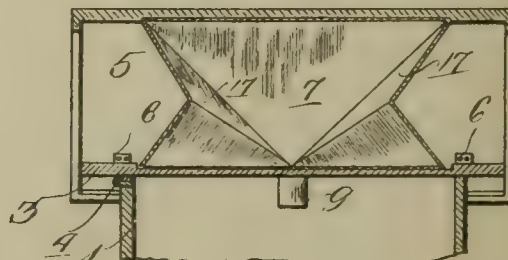
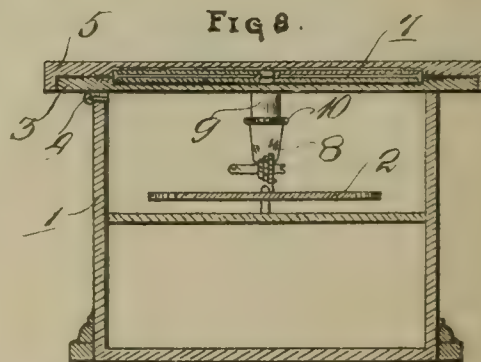


Fig 8.



WITNESSES.

Ernest C. Battey
J. H. Burson

INVENTOR.

Arthur E. Madison,
by Anton Glazner
His attorney.

UNITED STATES PATENT OFFICE.

ARTHUR E. MADISON, OF SANTA BARBARA, CALIFORNIA.

CABINET FOR SOUND-REPRODUCING MACHINES.

946,243.

Specification of Letters Patent.

Patented Jan. 11, 1910.

Application filed November 10, 1908. Serial No. 461,894.

To all whom it may concern:

Be it known that I, ARTHUR E. MADISON, a citizen of the United States, residing at Santa Barbara, in the county of Santa Barbara and State of California, have invented certain new and useful Improvements in Cabinets for Sound-Reproducing Machines, of which the following is a specification.

This invention has reference to a cabinet for sound reproducing machines, and particularly contemplates the provision of a collapsible or foldable horn or sound amplifier, which forms a part of the cabinet.

One of the objects of this invention is to provide a cabinet for sound reproducing machines with a self-contained sound horn, which, forming a unit with the cabinet, is capable of being concealed from view, thus rendering the cabinet conveniently portable, eliminating the necessity of a separate horn, and removing all liability of injury to the horn.

Another object of this invention is to provide a cabinet for sound reproducing machines having a self contained horn, which may be opened to its fullest extent or only to a limited extent whereby to obtain a modulation of the sounds emitted during the reproduction of a record.

With these and other objects in view, this invention consists of the features, details of construction, and combination of parts, as will be described in connection with the accompanying drawings, and then be more particularly pointed out in the claims.

In the drawings, Figure 1, is a perspective view, showing the invention as applied. Fig. 2, is a perspective view showing the lids and the lateral door in open position. Fig. 3, is a perspective view showing the invention as applied to a cabinet, the horn being shown in open position. Fig. 4, is a perspective view showing a cabinet with the lids closed. Fig. 5, is a side elevation showing the sound reproducing box, the two lids in open position, and the interposed collapsible horn. Fig. 6, is a front elevation, showing the open position of the lids, and the open position of the lateral door, by means of which the records and needles may be changed. Fig. 7, is a sectional elevation, showing the lid and the horn attached thereto only partly open, the cabinet or motor-containing box being shown in fragment. Fig. 8, is a sectional view, showing the interposed foldable horn in closed position.

Specifically referring to the drawings, 1, designates a box for the sound-reproducing machine 2.

3 is a lid hinged at 4, to one side of the box 1, and 5, designates another lid hinged at 6, to said lid 3. Interposed between said lids 3 and 5, is a sidewise collapsible or foldable horn or sound amplifier 7, fastened in any suitable manner to said lids 3 and 5, which horn or sound amplifier tapers rearwardly toward the rear of both lids.

Communication is afforded between the horn 7, and the tone arm 8, by a tube 9, which extends into an opening provided therefor in the lid 3, as seen in Figs. 2, 5, 6 and 7, and which projects on the underside of said lid 3, to a sufficient distance to conveniently fit into the terminus 10 of the tone arm 8.

The provision of a tube for transmitting the sounds from the tone arm to the sound horn or amplifier, is not an absolute requisite, but has been employed and shown in the present instance merely to illustrate a means for readily causing the direct travel of sound vibrations to the horn. It is, however, obvious, that the terminus of the tone arm may be in direct communication with the horn, without the interposition of any means to carry the sounds from the record to the horn.

In order to permit of the easy access to the interior of the box 1, I provide a lateral door 11, arranged to swing outwardly beneath the lid 3, and to cause the simultaneous opening of the said lateral door 11, with the reversely hinged lids 3 and 5, I provide links 12, on the said door and the lid 3, which links are joined together by a pivot pin 13. To permit of the travel of said links a trifle beyond the point of dead center, a lug 14 is provided on one of the links, and in this manner the links form a rigid support for holding open the lids 3 and 5 and the door 11.

15 designates a means in the nature of a curved rod, pivoted to the underside of the lid 5 and arranged to hold said lid 5 open relatively to said lid 3. It is provided with teeth 16, which are arranged to engage the lid 3, whereby to regulate the extent to which the collapsible or foldable horn may be opened, and also to retain the lid 5 in its adjusted position. Thus by regulating the size of the opening of the horn, the sounds emanating from the tone arm may

be considerably modulated according to desire.

The collapsible or foldable horn 7, as shown in the drawings, consists of segmental strips 17 of any suitable material best adapted for the purpose, and joined at the edges in such manner as to have movement relatively to each other, but any collapsible or foldable horn or sound amplifier, forming an integral part of the cabinet, irrespective of the construction thereof, may be employed in connection with this invention, without departing from the spirit thereof.

When the invention is embodied in a non-portable or stationary cabinet, as shown in Figs. 3 and 4, it is obvious that the same may be conveniently used as a table by closing the lids, thereby removing the horn.

What I claim, is:

1. A cabinet for sound reproducing machines and the like, having a lid provided with a horn, said horn being arranged to be expanded and collapsed by said lid.

2. A cabinet for sound reproducing machines and the like having two lids and a horn secured to both of said lids and arranged to be opened and closed with one of said lids.

3. A cabinet for sound reproducing machines and the like, having a lid, and a foldable horn connected with said lid and said cabinet, and arranged to be opened and closed with said lid.

4. A cabinet for sound reproducing machines and the like, comprising a box having two lids, and a foldable horn interposed between and connected with said lids.

5. A cabinet for sound reproducing machines and the like, comprising a box having two lids, one of said lids having communication with the interior of the cabinet, and a foldable horn interposed between said lids and arranged to be opened and closed by one of said lids.

6. A cabinet for sound reproducing machines and the like, comprising a box having reversely hinged lids, and a foldable horn interposed therebetween.

7. A cabinet for sound reproducing machines and the like, comprising a box having reversely hinged lids, a foldable horn interposed between said lids arranged to be opened and closed by one of said lids, and a

connection for the tone arm of such sound reproducing machine.

8. A cabinet for sound reproducing machines and the like, comprising a box having a lateral door, reversely hinged lids on said box, a foldable horn interposed between said lids and arranged to be opened and closed by one of said lids, communicating means between said foldable horn and the tone arm of such sound reproducing machine, said means being connected with one of said lids, and means connected with one of said lids and said lateral door, to open said lateral door simultaneously with said lids.

9. A cabinet for sound reproducing machines and the like comprising a box having reversely hinged lids, a foldable horn interposed between and connected with said lids, and means to hold the lids in open position.

10. A cabinet for sound reproducing machines and the like comprising a box having lids arranged to open in different directions, a foldable horn interposed between and connected with said lids said horn being arranged to be expanded and collapsed by one of said lids, and means to hold one of said lids open relatively to the other.

11. A cabinet for sound reproducing machines and the like having two lids opening in different directions relatively to each other, one of said lids having communication with the interior of the cabinet, and a foldable horn connected with and interposed between said lids.

12. A sound reproducing machine cabinet having two lids provided with a plurality of segmental strips secured to said lids and forming a horn, said strips being adapted to be expanded and collapsed by one of said lids.

13. In combination with a cabinet for sound reproducing machines and the like having a lid, a plurality of hinged segmental strips connected with said lid and said cabinet and forming a horn, said horn being arranged to be opened and closed by said lid.

In testimony whereof I affix my signature in the presence of two witnesses.

ARTHUR E. MADISON.

Witnesses:

ANTON GLOETZNER, Jr.,

JOSEPH J. PERKINS.

946,442.

Patented Jan. 11, 1910.

3 SHEETS—SHEET 1.

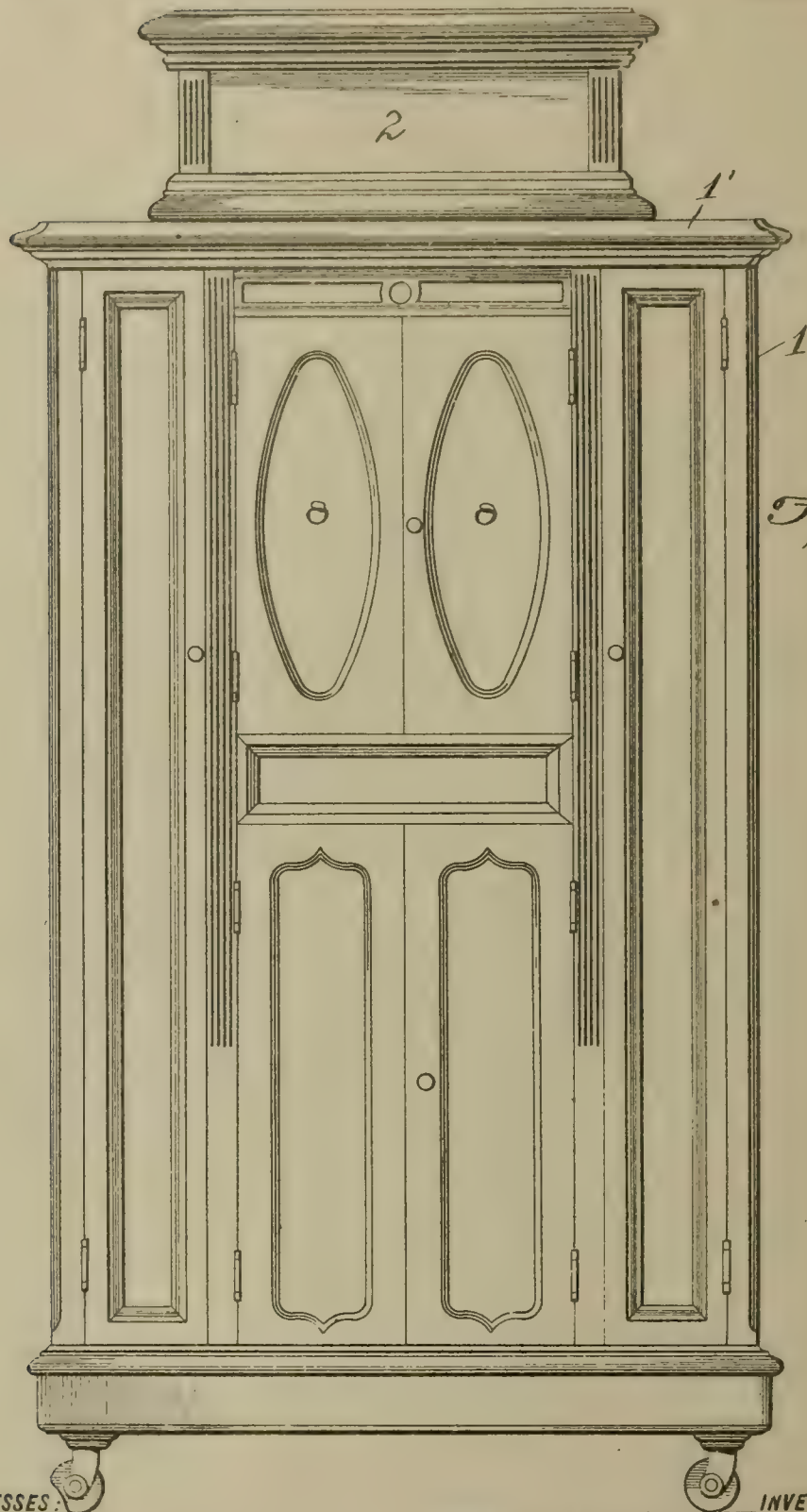


Fig. 1.

WITNESSES:

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INVENTOR

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E. R. JOHNSON.
TALKING MACHINE.
APPLICATION FILED JAN. 12, 1906.

946,442.

Patented Jan. 11, 1910.

3 SHEETS—SHEET 2.

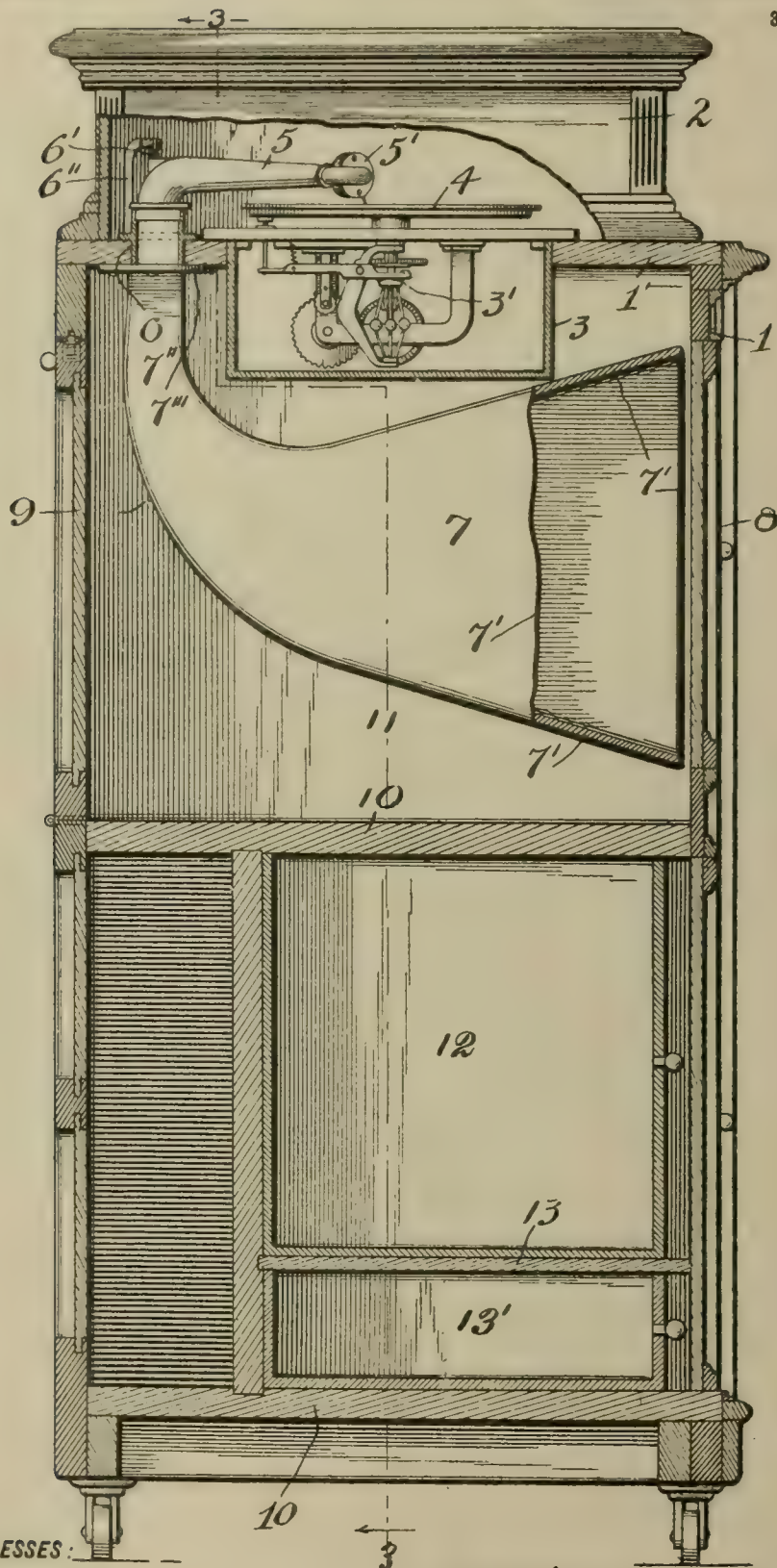


Fig. 2.

WITNESSES:

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946,442.

Patented Jan. 11, 1910.

3 SHEETS—SHEET 3.

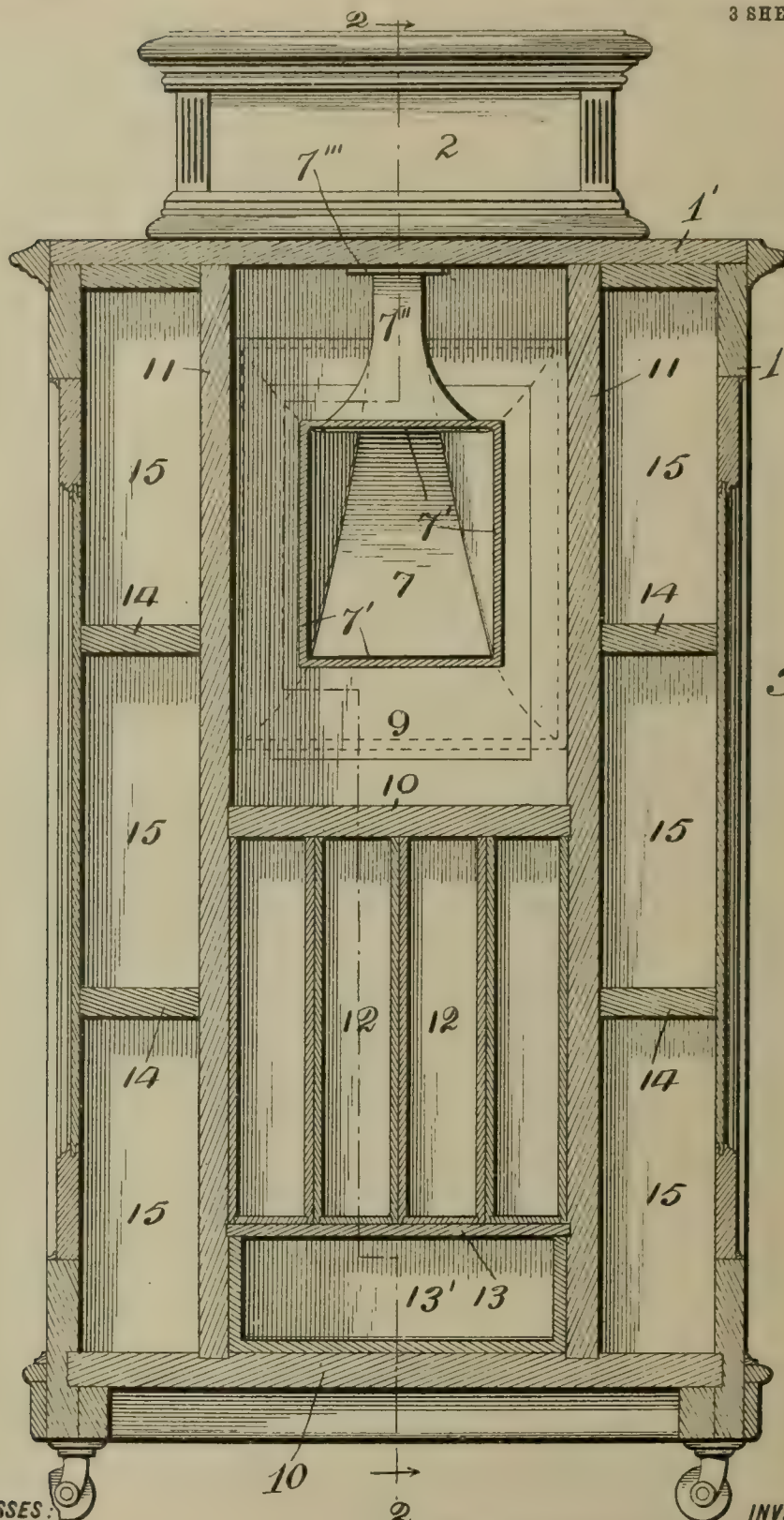


Fig. 3.

WITNESSES:

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2

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UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF MERION, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

TALKING-MACHINE.

946,442.

Specification of Letters Patent.

Patented Jan. 11, 1910.

Application filed January 12, 1906. Serial No. 295,707.

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of Merion, Montgomery county, State of Pennsylvania, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

This invention relates to improvements in talking machines, and more particularly to improvements in that class of talking machines in which the actuating mechanism and amplifying means are inclosed within a cabinet.

The main objects of this invention are, to provide in a talking machine, means whereby the quality of the reproduction will be improved; to provide a talking machine having a sound amplifier and improved means whereby the reproduced sounds may be modified and whereby the reproduced sounds may be controlled in direction after amplification; to provide a talking machine having an amplifier inclosed in a cabinet provided with an outlet opposite to and of substantially the same area as the delivery end of the amplifier and with a plurality of doors for opening and closing the outlet; to provide a talking machine having an amplifier inclosed in a cabinet and having a restricted opening surrounding the mouth of the amplifier and leading through a wall of the cabinet; to provide an inclosed talking machine having an improved arrangement of compartments for holding records, needles, and other talking machine accessories; to provide an improved sound amplifier; and to provide other improvements as will appear hereinafter.

In the accompanying drawings Figure 1 is a front elevation of a talking machine constructed in accordance with this invention; Fig. 2 a vertical section of the same on line 2—2 of Fig. 3 and Fig. 3 a vertical sectional view of the same on line 3—3 of Fig. 2.

Referring to the drawings, one embodiment of this invention comprises a cabinet having a main or body portion 1, upon the upper end wall 1' of which is located a removable cover 2. The upper end wall 1' of the body of the cabinet is provided with a substantially rectangular aperture in which rests a rectangular casing 3 containing a motor or actuating mechanism 3' connected to rotate the usual turn-table 4, located with-

in the top compartment of the cabinet, formed by the cover 2, the upper end of the body portion of the cabinet and the upper side of the motor casing. By thus inclosing the actuating mechanism in a separate casing within the cabinet, the sounds caused by the running of the motor are confined within the casing and are not permitted to mingle with the sounds of the reproduction. A tubular tapering sound box arm 5 carrying pivoted at its smaller end a sound box 5' with which it communicates, is mounted within the top compartment beneath the cover to swing over the turn table, the larger end of the arm being turned downwardly and telescoping in a tubular bushing 6, which fits tightly in an aperture provided through the upper end of 1' of the cabinet and the arm is held rotatably in position by means of a pivot 6' engaging the arm and supported in a fixed bracket 6".

In the upper portion of the body of the cabinet is fixed a horn or amplifier 7, which is preferably made of wood and is preferably substantially rectangular in transverse section throughout its full length, comprising four outwardly diverging side walls 7'. The body or major portion of the amplifier is substantially in the form of a truncated pyramid having a substantially horizontal longitudinal axis, and the inner portion of the amplifier is curved upwardly and inwardly longitudinally through an arc of about 90 degrees forming a curved throat or elbow and terminating in a substantially vertical portion 7'', the upper end of which is rigidly secured by a rigid annular plate or bracket 7''' to the under surface of the upper end 1' of the body of the cabinet, in register with the bushing 6 through which the amplifier communicates with the sound box arm 5.

The amplifier is supported entirely at its inner end, as described, and is in contact only at its inner end with any part of the machine. The mouth or delivery end of the amplifier terminates in close proximity to, but out of contact with, the front wall of the cabinet, and the front wall is provided with a rectangular opening opposite to and of substantially the same dimensions as the delivery end of the amplifier.

For modifying or directing the sound issuing from the amplifier, a pair of vertical doors 8 are arranged in the opening in the

wall of the cabinet in front of the amplifier, each door being hinged as at 8' at its outer vertical edge to swing outwardly on a vertical axis. These doors when closed entirely cover the opening in which they are mounted and muffle or soften the reproduction and when the doors are closed the interior of the amplifier remains in communication with the space within the cabinet surrounding the amplifier. When one or both of the doors are open or partially open the sound waves issue directly from the amplifier through the opening in the cabinet, and also the sounds from the chamber surrounding the amplifier issue through the restricted passage between the delivery end of the amplifier and the front wall of the cabinet and mingle with the sound passing outwardly through the cabinet from the interior of the amplifier, and it is thought that this gives a desirable quality to the reproduction. The doors 8 may also be used to deflect the sound in any desired direction or to vary at will the quality of the reproduction on either side of the cabinet or inclosure by arranging the doors at suitable angles. The back of the cabinet is provided with a door 9 adapted to give access to the compartment in which the amplifier is located.

Arranged beneath the amplifier 7 and spaced from the bottom 10 of the cabinet is a suitable horizontal partition 10', and on either side thereof are vertical partitions 11 spaced from the side walls of the cabinet and extending from the bottom 10 of the cabinet to the top wall 1' of the body of the cabinet. The upper end wall 1', the motor casing 3, the front and rear walls including the doors 8 and 9, the vertical partitions 11 and the horizontal partition 10', together form an inclosure entirely surrounding the amplifier.

Below the partition 10 and between the vertical partitions 11—11 are suitably arranged vertical boxes 12, adapted to contain records and below said box is a horizontal partition 13, below which is a drawer 13' for holding talking machine needles and other talking machine accessories. On either side of the vertical partitions 11, and between the same and the outer side walls of the cabinet are suitably arranged horizontal partitions 14 which provide compartments 15 also adapted to contain talking machine records of various sizes.

Although only one form in which this invention may be embodied has been illustrated, it is obvious that many changes might be made in the construction shown without departing from the spirit of this invention or the scope of the appended claims.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:—

1. The combination with a talking ma-

chine, of a cabinet and a wooden sound amplifier inclosed within and rigidly supported at one end by said cabinet, the horizontal axis of the major portion of said amplifier being substantially horizontal, said cabinet having an opening in alinement with the free end of said amplifier, and said free end of said amplifier being spaced from said cabinet to provide a restricted passage between said opening and the inclosed space surrounding the major portion of said amplifier.

2. The combination with a talking machine, of a sound amplifier inclosed within and rigidly supported by said cabinet, the portion adjacent the free end of said amplifier being arranged substantially horizontally and terminating adjacent but out of contact with a side of said cabinet, said cabinet being provided with an opening in alinement with the free end of said amplifier, and means to deflect the sound issuing from said opening to the right or to the left.

3. The combination with a talking machine, of a cabinet, and a sound amplifier inclosed within said cabinet, said amplifier having a substantially vertical portion and secured to said cabinet by the end of said vertical portion only, and a substantially horizontal free end, the said free end terminating within said cabinet out of contact with the adjacent side thereof, said cabinet having an opening in alinement with the free end of said amplifier.

4. In a talking machine, a cabinet having a plurality of compartments, sound reproducing means inclosed within one of said compartments, an amplifier entirely contained within another of said compartments and in communication with said sound reproducing means, said cabinet having an opening in a side thereof, and said amplifier having its delivery end in alinement with said opening but spaced apart from said side of said cabinet to provide a restricted passage between the compartment surrounding said amplifier and said opening.

5. In a talking machine, a cabinet having a plurality of compartments, sound reproducing means inclosed within one of said compartments, an amplifier entirely contained within another of said compartments and in communication with said sound reproducing means, said cabinet having an opening in a side thereof, means to open and close or partially open said opening in said cabinet, and said amplifier having its delivery end in alinement with said opening but spaced apart from said side of said cabinet to provide a restricted passage between the compartment surrounding said amplifier and said opening.

6. In a talking machine, a cabinet having an upper compartment, reproducing means inclosed within said compartment, a lower

compartment, an amplifying horn inclosed within said lower compartment, said amplifying horn being connected at its smaller end to said sound reproducing means and having its other end substantially coinciding with an opening in said cabinet and having its edges out of contact with said cabinet.

7. In a talking machine, a cabinet having an upper compartment, reproducing means inclosed within said compartment, a lower compartment, an amplifying horn inclosed within said lower compartment, said amplifying horn being connected at its smaller end to said sound reproducing means and having its other end substantially coinciding with an opening in said cabinet and having its edges out of contact with said cabinet, and doors adapted to close said opening and also adapted to modify the sounds emitted from said horn.

8. In a talking machine, a cabinet having a plurality of compartments, sound reproducing means inclosed within a topmost compartment, an amplifying horn contained within the adjacent compartment, said horn being connected at its smaller end to said sound reproducing means, and having its larger end substantially coinciding with an opening in said cabinet and having its edges out of contact with said cabinet.

9. In a talking machine, a cabinet having a plurality of compartments, sound reproducing means inclosed within the topmost compartment, an amplifying horn contained within the adjacent compartment, said horn being connected at its smaller end to said sound reproducing means, and having its larger end substantially coinciding with an opening in said cabinet and having its edges out of contact with said cabinet, and doors for said opening adapted to vary the sounds emitted from said horn.

10. In a talking machine, a cabinet having an upper compartment, sound reproducing means inclosed within said upper compartment, an amplifying horn contained within the compartment directly beneath said upper compartment, said horn being in connection at its smaller end with said sound reproducing means, and having its larger end substantially coinciding with an opening in said cabinet, but having its edges out of contact with said cabinet and doors to said opening adapted to modify the sounds issuing from said horn.

11. In a talking machine, a cabinet having an upper compartment, sound reproducing means inclosed within said upper compartment, an amplifying horn contained within the compartment directly beneath said upper compartment, said horn being in connection at its smaller end with said sound reproducing means, and having its larger end substantially coinciding with an opening

in said cabinet, but having its edges out of contact with said cabinet, and means upon the cabinet for modifying the sounds issuing from said horn.

12. In a talking machine, a cabinet having a plurality of compartments, sound reproducing means inclosed within a topmost compartment, an amplifying horn contained within a lower compartment, said horn being connected at its smaller end to said sound reproducing means and having its larger end adjacent an opening in said cabinet and having its edges out of contact with said cabinet, and means upon the cabinet for modifying the sounds issuing from said horn.

13. In a talking machine, a cabinet having a compartment, a sound amplifier inclosed within said compartment and having a delivery end terminating within but out of contact with a side of said cabinet and in alinement with an opening therein.

14. In a talking machine, a cabinet having two compartments, sound reproducing means contained in the first of said compartments and sound amplifying means inclosed within the second of said compartments, said sound amplifying means consisting of a hollow body having tapering sides, said amplifier being supported within its compartment from its smaller end, said cabinet having an opening adjacent to the larger end of said amplifier, and a pair of doors mounted on said cabinet to open and close said opening.

15. In a talking machine, a cabinet, sound reproducing and sound amplifying means mounted within and entirely inclosed by said cabinet, said cabinet being provided with an opening adjacent and of substantially the same size as the delivery end of said amplifier, and a pair of doors mounted on said cabinet and arranged to open and close said opening.

16. In a talking machine, a cabinet and a motor, a sound reproducer and a sound conveyer all inclosed within said cabinet, and a sound amplifier also mounted within said cabinet in a fixed relation thereto and having its discharge end brought adjacent one of the sides of said cabinet but out of contact with said side, said cabinet being provided with an opening registering with said end of said amplifier.

17. In a talking machine, a cabinet having a plurality of compartments, sound reproducing means inclosed within one of said compartments, an amplifying horn contained within another compartment, said horn being connected at its smaller end to said sound reproducing means, and having its larger end adjacent an opening in a side of said cabinet and out of contact with said cabinet to provide a restricted passage between the compartment containing the horn and said opening.

18. In a talking machine, a cabinet having a plurality of compartments, sound reproducing means inclosed within one of said compartments, an amplifying horn contained within the compartment directly beneath said compartment inclosing the said sound reproducing means, said horn being connected at its smaller end to said sound reproducing means and having its larger end adjacent an opening in a side of said cabinet and out of contact with said cabinet to provide a restricted passage between the compartment containing the horn and said opening.
19. The combination with sound reproducing means, of a cooperating amplifier, a cabinet inclosing the major portion of said amplifier and provided with an opening, of substantially the same size as the delivery end of said amplifier, and means to vary the quality of the reproduction at will on either side of said cabinet.
20. The combination with sound reproducing means, of a cooperating amplifier, an inclosure supporting the major portion of the amplifier at one end, said inclosure being provided with an opening in a side thereof of substantially the same size as the delivery end of said amplifier, and rigid means to open and close the said opening.
21. The combination with sound reproducing means and actuating mechanism, of a cooperating amplifier, an inclosure supporting the major portion of the amplifier rigidly at one end and below the said actuating mechanism, said inclosure being provided with an opening in a side thereof, and means to vary the quality of the reproduction at will on either side of said inclosure.
22. The combination with sound reproducing means, of a cooperating amplifier having a curved throat and four diverging side walls, an inclosure supporting the major portion of the throat and walls of said amplifier rigidly at one end, said inclosure being provided with an opening in a side thereof, and a plurality of means adjacent said opening, each arranged to open and close a part only of said opening.
23. The combination with sound reproducing means, of a cooperating amplifier having a curved throat and flat diverging side walls, an inclosure supporting the major portion of the throat and walls of the amplifier rigidly at one end, said inclosure being provided with an opening in a side thereof, and a plurality of means adjacent said opening, each arranged to open and close a part only of said opening.
24. The combination with sound reproducing means, of a cooperating sectional sound directing amplifier, an inclosure supporting the major portion of the amplifier, said inclosure being provided with an opening in a side thereof of substantially the same size as the delivery end of said amplifier, and a plurality of means adjacent said opening, each arranged to open and close a part only of said opening.
25. The combination with sound reproducing means, of a cooperating amplifier, an inclosure supporting the major portion of the amplifier rigidly at one end and having an opening adjacent and of substantially the same size as the delivery end of said amplifier, and a plurality of sound modifying doors mounted in one of the walls of the inclosure each door being arranged to open and close a part only of said opening.
26. The combination with sound reproducing means, of a cooperating amplifier, an inclosure supporting the major portion of the amplifier rigidly at one end and having an opening adjacent to and of substantially the same size as the delivery end of said amplifier and below the talking machine, and a plurality of sound modifying doors mounted in one of the walls of the inclosure to vary at will the quality of the reproduction on either side of the inclosure.
27. The combination with sound reproducing means, of a cooperating amplifier having a curved throat and four diverging side walls, an inclosure supporting the major portion of the throat and walls of the amplifier rigidly at one end and having an opening adjacent to and of substantially the same size as the delivery end of said amplifier, and a plurality of sound modifying doors mounted in one of the walls of the inclosure each door being arranged to open and close a part only of said opening.
28. The combination with sound reproducing means, of a cooperating amplifier having a curved throat and four diverging side walls, an inclosure supporting the major portion of the throat and walls of the amplifier rigidly at one end and having an opening adjacent to and of substantially the same size as the delivery end of said amplifier and below the talking machine, and a plurality of sound modifying doors mounted in one of the walls of the inclosure to vary at will the quality of the reproduction on either side of said inclosure.
29. The combination with sound reproducing means, of a cooperating amplifier having a curved throat and flat diverging side walls, an inclosure supporting the major portion of the amplifier rigidly at one end and having an opening adjacent to and of substantially the same size as the delivery end of said amplifier, and a plurality of sound modifying doors mounted in one of the walls of the inclosure each door being arranged to open and close a part only of said opening.
30. The combination with sound reproducing means, of a cooperating amplifier connected therewith, an inclosure support-

ing the major portion of the amplifier, and a cabinet embracing the inclosure and spaced from the side walls of said inclosure.

31. The combination with sound reproducing means, of a cooperating amplifier connected therewith, an inclosure supporting the major portion of the amplifier in a fixed position, and a cabinet embracing the inclosure and spaced from the side walls of said inclosure.

32. The combination with actuating mechanism, of sound reproducing means, a cooperating amplifier connected therewith, an inclosure supporting the major portion of the amplifier below the actuating mechanism, and a cabinet embracing the inclosure and spaced from the side walls of said inclosure.

33. The combination of sound reproducing means, of a cooperating amplifier, an inclosure embracing the major portion of the amplifier, said inclosure having an opening in a side thereof opposite and of substantially the same size as the mouth of the amplifier, the mouth of the amplifier being spaced from the walls of the opening to form a restricted passage between the space within the inclosure surrounding the amplifier, and said opening.

34. The combination of sound reproducing means, of a cooperating amplifier, an inclosure embracing the major portion of the amplifier rigidly at one end only, said inclosure having an opening in a side thereof opposite and of substantially the same size as the mouth of the amplifier, the mouth of the amplifier being spaced from the walls of the opening to form a restricted passage between the space within the inclosure surrounding the amplifier, and said opening.

35. In a talking machine, the combination with a cabinet of an amplifier the delivery end of which terminates within said cabinet, but out of contact therewith, said cabinet being provided with an opening adjacent said

delivery end and of substantially the same size as said delivery end.

36. In a talking machine, the combination with a cabinet of an amplifier the delivery end of which terminates within said cabinet, but out of contact therewith, said cabinet being provided with an opening adjacent said delivery end and of substantially the same size as said delivery end, and means for closing said opening.

37. In a talking machine, the combination with a cabinet of an amplifier the delivery end of which terminates within said cabinet, but out of contact therewith, said cabinet being provided with an opening adjacent said delivery end and of substantially the same size as said delivery end, and a plurality of doors for closing said opening.

38. In a talking machine, the combination with a cabinet, of an amplifier extending within said cabinet, said cabinet being provided with an opening in a side thereof adjacent and of substantially the same size as the delivery end of said amplifier and having a restricted passage between the space within said cabinet surrounding said amplifier and said opening.

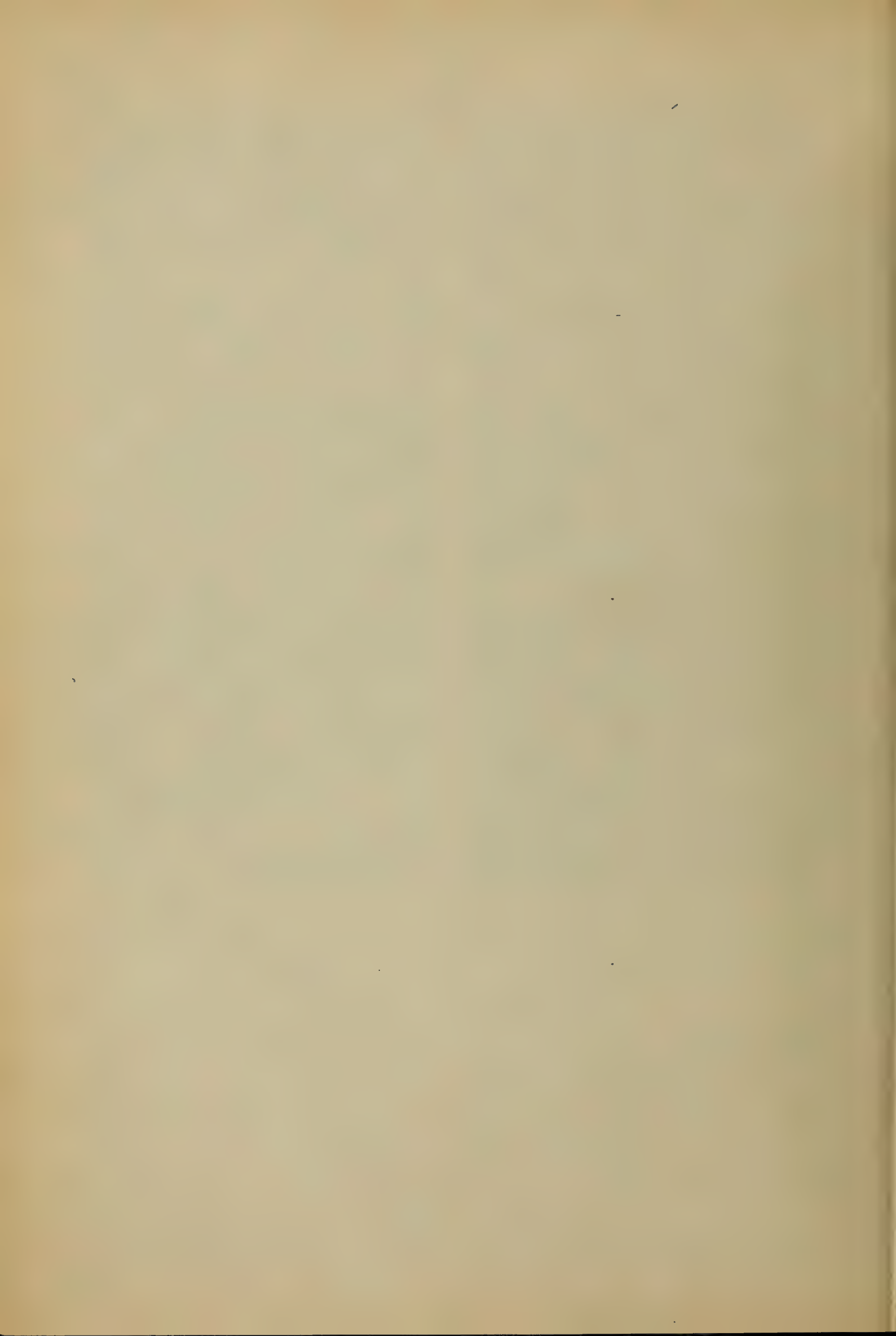
39. In a talking machine, the combination with a cabinet, of an amplifier extending within said cabinet, said cabinet being provided with an opening in a side thereof adjacent and of substantially the same size as the delivery end of said amplifier and having a restricted passage between the space within said cabinet surrounding said amplifier and said opening, and means for closing said opening.

In witness whereof, I have hereunto set my hand this 11th day of January, 1906.

ELDRIDGE R. JOHNSON.

Witnesses:

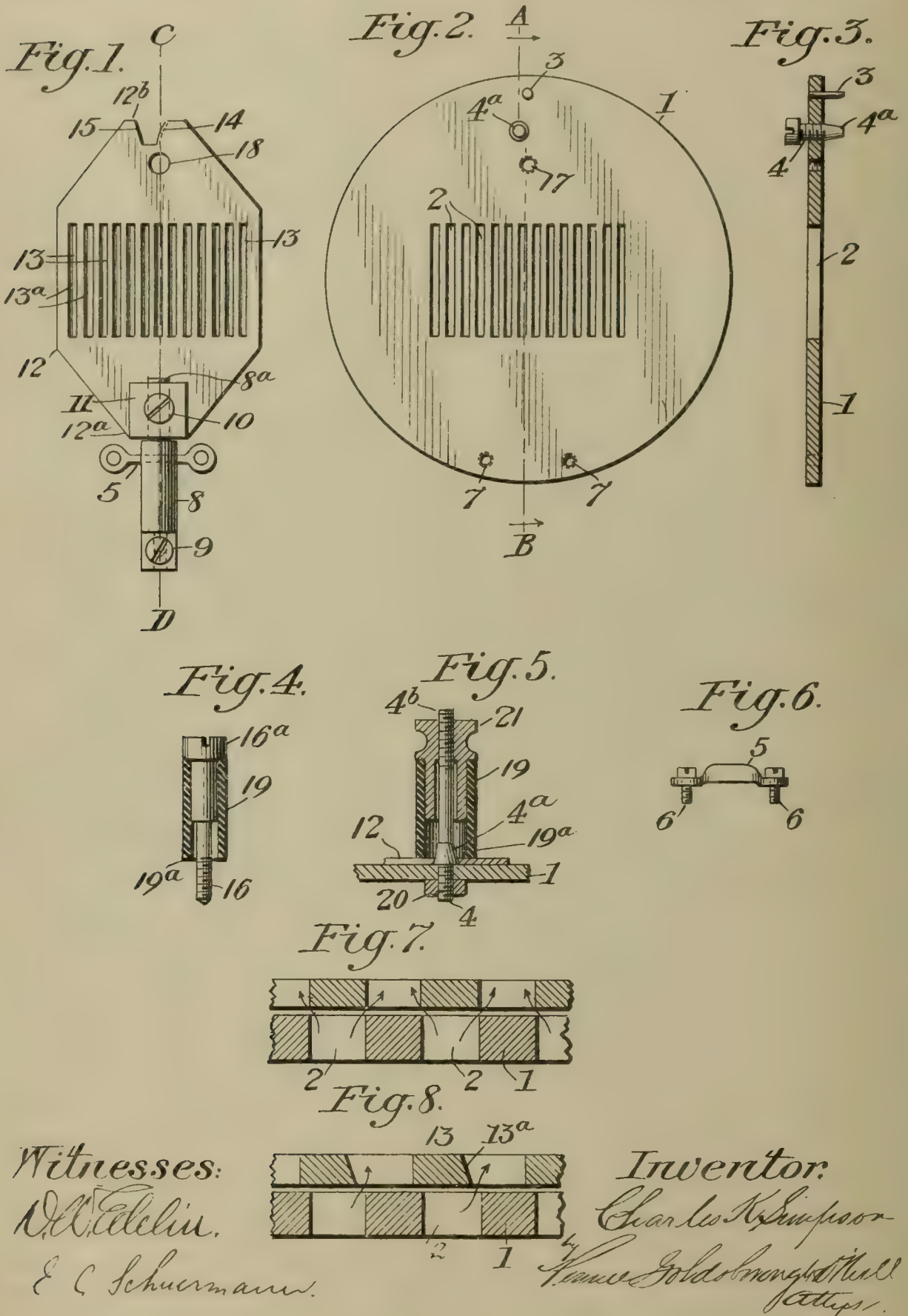
HORACE PETTIT,
ALEXANDER PARK.



C. K. SIMPSON.
 VALVE FOR THE SOUND BOXES OF TALKING MACHINES.
 APPLICATION FILED MAY 22, 1909.

946,524.

Patented Jan. 11, 1910.



UNITED STATES PATENT OFFICE.

CHARLES K. SIMPSON, OF HONOLULU, TERRITORY OF HAWAII, ASSIGNOR OF ONE-EIGHTH TO A. P. McDONALD, OF HONOLULU, TERRITORY OF HAWAII.

VALVE FOR THE SOUND-BOXES OF TALKING-MACHINES.

946,524.

Specification of Letters Patent.

Patented Jan. 11, 1910.

Application filed May 22, 1909. Serial No. 497,698.

To all whom it may concern:

Be it known that I, CHARLES K. SIMPSON, a citizen of the United States, residing at Honolulu, county of Honolulu, Territory of Hawaii, have invented certain new and useful Improvements in Valves for the Sound-Boxes of Talking-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to sound-boxes for talking machines, which employ compressed air to produce the sound, and particularly to the construction and action of the valve in such sound-boxes, through which the air is passed; and the objects of my improvements are, to increase the sound and improve the tone produced, and to decrease the compressed air expended.

My invention relates particularly to and is an improvement in that class of sound-boxes illustrated in the French patent, No. 372,225, dated Nov. 24, 1906, in which a gridiron valve is employed, operated by a stylus which travels over the record. In this type, each bar of the gridiron valve exactly covers a slotted opening in the valve seat, when the valve is closed. The stylus in following the record lifts the valve from the seat and in a direction at right angles thereto, allowing air to issue through the openings in the seat in intermittent jets, their character and frequency depending upon the action of the stylus. One end of the valve, to which the stylus is removably attached, is mounted upon the seat in a manner such that the valve may be sprung from the seat by the action of the stylus in following the record; the valve in seating is guided by a pin in the seat passing through a hole or slot in the other end of the valve. The lifting of the valve is aided by the air, and resisted by the mounting at the stylus end and by a cushion at the other end.

My invention contemplates changes in the construction and action of the valve whereby much louder and more perfect tones are produced with the expenditure of less air. The principal changes of construction are: in the spring clamp, which flexibly secures the valve to the seat; in the shape of the guiding pin in the seat, against which the end of the valve rests, the pin being tapered

and the edge of the valve correspondingly beveled; and in the bars of the gridiron valve, one edge of each bar being beveled. The action of the valve is thereby changed, as will hereinafter more fully appear.

In the drawings, Figure 1 is a plan view of my improved gridiron valve. Fig. 2 represents a plan view of its valve seat. Fig. 3 represents a section on the line A—B of Fig. 2. Fig. 4 is a detail of the cushion and its adjusting screw. Fig. 5 is a sectional view of a modification. Fig. 6 is an elevation of the spring clamp. Fig. 7 is a diagram illustrating the passing of the air jets through an ordinary gridiron valve. Fig. 8 is a diagram illustrating the same through my improved valve.

Referring to the drawings; the valve seat plate 1 is provided with the parallel slots 2, a dowel 3 for holding seat plate in place, and a pin 4 having a hardened tapered point 4^a the pin 4 being preferably screwed in said plate. A spring clamp 5 is attached to the seat plate 1 by screws 6 in the holes 7 tapped in said plate. The spring clamp 5 is made weakest in a plane parallel to the seat plate 1. The stylus holder 8, which is secured to the spring clamp 5, is provided with the screw 9 for securing the stylus in the usual manner. The holder 8 has a pin-end 8^a, which is clamped by the set-screw 10 in the block 11. This block 11 is secured to the end 12^a of the valve plate 12. The valve plate 12 is provided with the bars 13, forming a gridiron type of valve, adapted to exactly cover the slots 2 in the seat plate 1, when the valve is closed and at rest. The edges 13^a of the bars 13 are preferably beveled and of greatest width at the inner or lower face of the valve to permit of a freer exit for the air and a sharper cut-off, Figs. 1 and 8. The end 12^b of the valve plate 12 is notched, as shown in Fig. 1, such that the beveled edge 14 engages the taper 4^a of the pin 4, and preferably approximately on the center-line C—D of the valve plate 12. The edge 15 is cut away to clear said pin. The screw 16, which fits the tapped hole 17 in the seat plate 1, passes through the clearance hole 18 in the valve plate 12. A cushion 19, of rubber or other suitable material, is interposed between the valve plate 12 and the head 16^a of the screw 16, by which the tension of the cushion against the valve near its end 12^b is adjusted. The end 19^a of said

cushion, which engages the valve plate 12, is made so as to clear the screw 16, to permit of a freer movement of the valve in following the taper 1^a of the pin 4 when lifting.

6 The tapered pin and the cushion arrangement may, if desired, be combined, as shown in the modification, Fig. 5, in which the pin 1 is screwed into the seat plate 1 and is provided with the lock-nut 20, the tapered portion 1^a forming a shoulder. The pin 4 is
10 extended above the tapered portion 4^a and threaded 4^b to receive the adjusting nut 21.

When the valve lifts at right angles to the seat, as has heretofore been the practice,
15 air is permitted to escape through the slots in the seat and pass between the bars of the valve, the jets meeting as indicated by arrows in Fig. 7. With my improvements, however, the valve plate 12 in lifting from
20 the seat plate 1, does not move at right angles to said plate, but moves away from the seat in a direction to the left hand in reference to the view of the valve shown in Fig. 1, being guided by the shape of the
25 edge 14 which engages the taper 4^a of the pin 4. This provides freer passages for the jets of air, as will be noted by reference to Fig. 8.

As a result of my improvements above described, the tone is improved, the volume of
30 sound is increased, while the air expended is reduced.

I claim:

1. The combination with a valve for a
35 sound box, and a seat for said valve from which the latter is lifted, of means to shift the valve laterally as it lifts.

2. In a sound box valve, a lifting valve, a
40 stylus holder carried thereby, a valve seat, and means to guide the valve laterally with

respect to the seat during the lifting movement of the valve.

3. The combination with a valve for a sound box, and a seat for the valve, of a tapered guide member for the valve which
45 causes it to shift laterally during its lifting movement.

4. In a sound box valve, a valve seat, a valve, a stylus holder carried by the valve, and a tapered guide pin on the seat which
50 moves the valve laterally as it rises from the seat.

5. In a sound box valve, a valve seat, a tapered guide pin carried thereby, a valve having a beveled edge engaging said pin,
55 and a stylus holder mounted on the valve.

6. In a sound-box valve, a valve seat, and a gridiron valve, each bar of said valve being beveled at one edge and of greatest
60 width at the inner or lower face of the valve.

7. A sound-box valve having a plurality of parallel bars, one edge of each bar being straight and the other edge beveled, for the purpose described.

8. In a sound-box valve, the combination
65 of a valve seat, a gridiron valve, a screw 16 for adjusting the parts, and a cushion 19, the end of which clears said screw, as described.

9. In a sound-box valve, a valve seat comprising a seat plate 1, a valve plate 12 having a beveled edge 14, and a guide pin 4
70 against which beveled edge 14 abuts.

In testimony whereof I affix my signature, in presence of two witnesses.

CHARLES K. SIMPSON.

Witnesses:

A. P. McDONALD,

ROBB J. PRATT.

W. C. RHODES.
 RECORD PLATE FOR GRAPHOPHONES AND LIKE MACHINES.
 APPLICATION FILED JAN. 27, 1909.

946,563.

Patented Jan. 18, 1910.

Fig. 1.

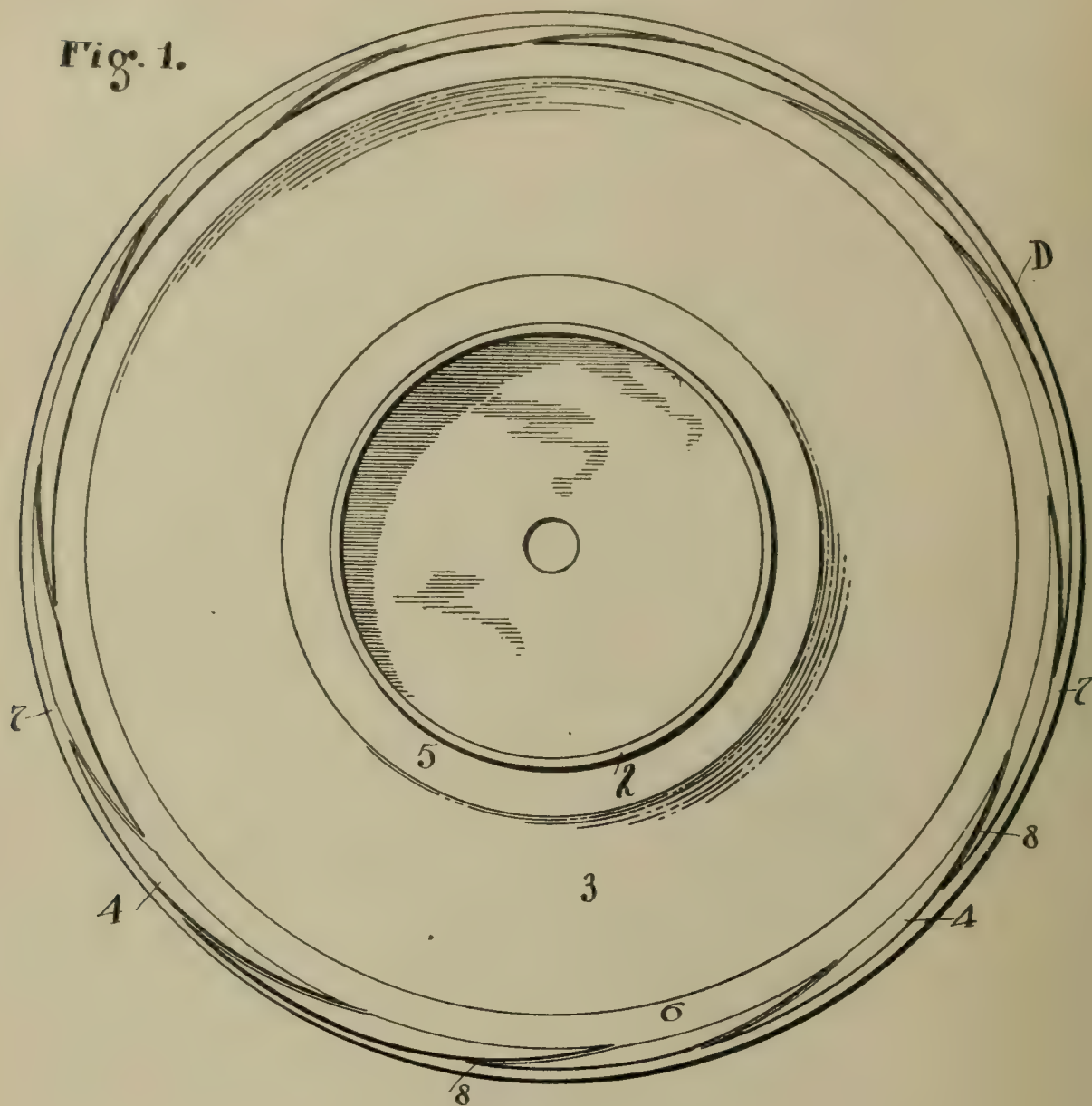


Fig. 2.



ATTEST
E. M. Fisher
J. C. Musson,

INVENTOR
William C. Rhodes.
 BY *Fisher & Moser* ATTYS.

UNITED STATES PATENT OFFICE.

WILLIAM C. RHODES, OF CLEVELAND, OHIO.

RECORD-PLATE FOR GRAPHOPHONES AND LIKE MACHINES.

946,563.

Specification of Letters Patent.

Patented Jan. 18, 1910.

Application filed January 27, 1909. Serial No. 474,363.

To all whom it may concern:

Be it known that I, WILLIAM C. RHODES, citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Record-Plates for Graphophones and Like Machines, of which the following is a specification.

My invention relates to record plates for graphophones and like machines, all substantially as shown and described and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of the plate or disk, and Fig. 2 is a central cross section thereof.

The plate or tablet D as thus shown is flat and of disk form, and has a rib or bead 2 upon its face side on a radius approximately one-third the width of the plate from its center, in this instance, and stands above the record surface about as shown in the drawings, so that said rib comes about the inner border 5 of record surface 3 and which border or surplus space is usually reserved for possible use in case the matter to be recorded is of exceptional length. The said rib or bead 2 comes about the inner limits of said space 5 while a corresponding border 6 is shown near the outside of the record or inscribed surface 3. The said corresponding border 6 consists of a succession of raised segments 4, which are relatively as high as rib 2 and run to points at their ends and are separated by fine or narrow correspondingly curved slots or spaces 8 leading in onto the plate from the outside and as deep as said segments. Now, as to the utility and advantages of these raised portions 2 and 4, it is noted, first, that said rib 2 affords an effectual check or stop to the travel or throw of the needle when it has run its course on the record surface and which would continue to travel or be thrown inward toward the center of the plate if there were nothing to stop it. Heretofore, in flat plates, the sole dependence of the machine to avoid this and consequent danger or injury to the diaphragm or sound box by contact with parts at the center of the plate has been the care or watchfulness of the operator, but this cannot always be relied upon, especially with inexperienced or forgetful persons, and, in fact, the operator should not and need not be taxed in this way. Hence the conception worked out by me in or through said rib

or bead 2, which automatically stops the travel of the parts beyond said rib, or its equivalent, regardless of the operator. The machine might run indefinitely and not sustain injury with a precautionary stop of this kind in use. It also serves as a central support for superposed plates to protect the record surface. Finally, as to segments 4 near the edge of the plate, it will be noticed that they are separated by the said curved slots or channels 8 which begin at the outer side and run inward onto the surface of the plate the full depth of said segments. Said slots are designed to intercept the needle and lead it in upon the plate in case the operator by mistake or carelessness starts it outside on the edge 7. If this be done the needle can travel only a short distance before it will enter the first lead slot 8 and come into position inside to do its work.

The portion 2 is described as a rib or bead, and such is its preferable form, but if the inner portion of the plate indicated by 10 and extending for a distance about pivot hole 12 in the center of the disk were made relatively as much thicker as said rib indicates and thus produce a shoulder it would serve my purpose measurably as well as a rib so far as forming a stop for the needle is concerned and also for protecting the record surface 3, but it would add objectionably to the weight of the plate and hence is not as desirable as the rib alone. Again, the exact location of said rib or shoulder is not in itself material provided that it be between the central hole 12 and the inner border of record or engraved surface 3, but a position not far removed from said inner border is deemed best, say about as shown in the accompanying drawings.

What I claim is:

1. A plate for graphophones and the like having a succession of segments near the outer edge thereof standing uniformly above the record surface of the plate and open slots for the needle to run in between said segments the full depth thereof and adapted to land the needle directly upon said record surface from the outside, and a flat annular rim outside said segments even with the slots between the same and adapted to carry the needle up to said slots.

2. A graphophone plate provided with a flat record surface and a series of segments near the outer edge thereof standing higher

than said surface and curved slots between
said segments the full depth thereof form-
ing successive leads for the needle inward
onto said record surface and a flat annular
5 rim next outside said leads and segments,
and an annular rise next within said record
surface to limit the inward travel of the
needle after it has traversed the record, thus
automatically controlling the entrance of the

needle upon said record surface and after it 10
leaves the same.

In testimony whereof I affix my signature
in presence of two witnesses.

WILLIAM C. RHODES.

Witnesses:

F. C. MUSSUN,

E. M. FISHER.

L. P. VALIQUET.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED OCT. 28, 1903.

946,589.

Patented Jan. 18, 1910.

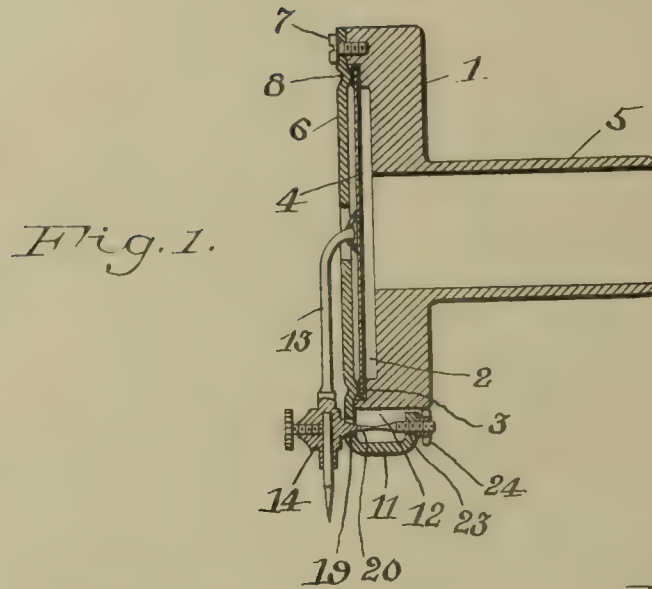


Fig. 2.

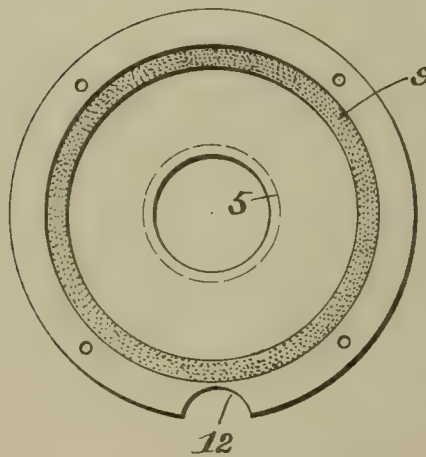


Fig. 3.

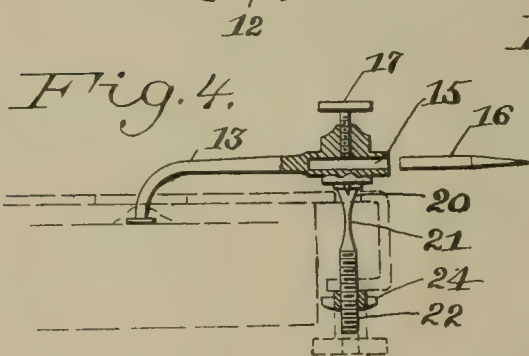
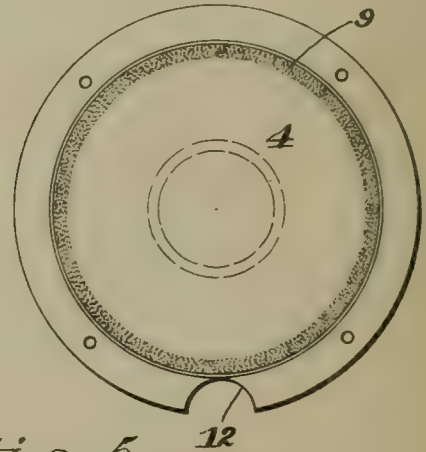
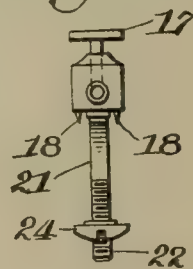


Fig. 5.



WITNESSES:

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INVENTOR

Louis P. Valiquet.

BY

John P. Pett.

ATTORNEY

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO
VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-BOX FOR TALKING-MACHINES.

946,589.

Specification of Letters Patent.

Patented Jan. 18, 1910.

Application filed October 28, 1903. Serial No. 178,932.

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of New York city, county of New York, State of New York, have invented certain new and useful Improvements in Sound-Boxes for Talking-Machines, (Case A,) of which the following is a full, clear, and complete disclosure.

The main objects of my invention are to provide an improved sound box casing, an improved mounting for a stylus bar, an improved mounting for a diaphragm and other improvements as will appear hereinafter.

In the drawings, Figure 1 is a central vertical section of a sound box constructed in accordance with this invention; Fig. 2, a face view of the same with the cover thereof removed, showing the annular cushion of insulating material upon which the diaphragm is seated; Fig. 3 a similar view showing the diaphragm in position; Fig. 4, a side elevation, partly in section of the stylus bar and its mounting, the sound box casing being indicated in dotted lines; and Fig. 5 is an end elevation of the stylus bar.

Referring to the drawings, the casing of the sound box comprises a body member 1, which is provided in the face thereof with a circular recess 2, forming a diaphragm chamber. Within this chamber and adjacent the front thereof, is provided an annular seat 3 for the diaphragm 4. The body of the sound box is provided with a rearwardly extending tubular portion 5 for connection with the usual amplifier. A cover 6, removably secured upon the body of the sound box by screws 7, serves to secure the diaphragm in position on its seat by being provided with an annular bead 8, which is cast, pressed, or otherwise formed upon the inner seat of the cover, and projects within the diaphragm chamber in close proximity to the annular seat upon which the diaphragm rests. An insulating annulus 9 of non-sonorous material, such, for example, as felt, or fiber, is interposed between the inner side of the diaphragm and its seat, and between the opposite or outer side thereof and the bead of the cover. This insulation is preferably applied to one or more of the opposing faces in the form of an adhering coating as indicated in Figs. 2 and 3. The insulating material is caused to adhere by first coating the portion to be covered with

a suitable cement, and then dipping the cemented part into a mass of the material, which latter will then be taken up in sufficient quantity to form an effective insulating cushion. In thus insulating the diaphragm, local or sympathetic vibration is avoided by preventing the vibration imparted to the stylus from being transmitted to the sound box casing, and, as a result, the tones of the reproductions will be free from the objectionable metallic qualities common to apparatus now in general use.

The sound box cover at its lower edge is extended in the form of a yielding, approximately U-shaped lug 11, which lies in a recess 12, forming the body portion of the box, and is designed to serve as a support for the stylus bar 13. The stylus bar 13 curves inward at its upper end and projects through a central opening provided therefor in the sound box cover, and is phonetically connected to the diaphragm in any well known manner, as, for example, by adhesive wax, or other material. The opposite or lower end of the stylus bar is provided with a socket 15 for the stylus 16, and the usual set screw 17 for holding the stylus in place. The mounting for the stylus bar comprises a pair of pointed studs 18, which project transversely from the bar, and which are seated in shallow depressions, or bearings, formed in the outer front surface of the U-shaped extension of the sound box cover, and which are equi spaced upon opposite sides of an opening 19 therein, through which extends the spring arm 20 for holding the bar in place. The spring arm 20 is integral with the stylus bar and projects substantially at right angles therefrom, perpendicular to the diaphragm and in the plane of the axis of oscillation of the stylus bar, the spring arm and the stylus bar together forming a substantially L-shaped holder. This spring arm is reduced in cross section for a portion of its length as indicated at 21, to make the bar sufficiently flexible to serve, not only to hold the bar upon its bearings, but also as a spring to exert an influence upon the oscillation of the bar. Beyond the reduced portion, the spring arm terminates in a threaded extension 22, which projects through an opening 23 in the inner lug of the U-shaped extension, and is engaged by a nut 24 which contacts with the

rear side of the lug to apply a tension longitudinal of the spring arm. The nut may be formed for engagement with a special form of screw driver or may be formed as indicated by dotted lines in Fig. 4, with a milled head to be readily operated by hand.

In the operation of this invention, after the parts are assembled as shown in Fig. 1, the nut 24 may be turned to bring to bear a sufficient amount of tension upon the spring arm for affecting a proper regulation of the oscillation of the stylus bar to produce the best results.

It is evident, of course, that various changes could be made in the details of construction shown, without departing from the spirit and scope of my invention. Other forms of spring might be employed, as well as the adjusting means therefor; the spring might be rearranged in its relation to the rigid arm of the holder and the same result obtained; but all such modifications, I consider merely unimportant variations of form and still within the scope of my invention.

Having, therefore, described my invention, what I claim as new and desire to protect by Letters Patent, is—

1. In a sound reproducer, a stylus bar mounted to oscillate on an axis transverse thereto, a spring connected to said bar, and means for exerting force in a direction away from and in the plane of the axis of oscillation transverse to said bar to tension said spring.

2. In a sound reproducer, a stylus bar, bearings therefor whereby said bar is mounted to oscillate on an axis transverse thereto, a spring rigidly connected with said bar and means for exerting force in a direction away from and in the plane of the axis of oscillation transverse to said bar, to produce a tension on said spring and to hold the bar in engagement with said bearings.

3. In a sound reproducer, a stylus bar or lever fulcrumed on centers, a spring rigidly connected with said bar and means for exerting force in a direction away from and in the plane of the axis of the centers, transverse to said bar, to produce a pressure upon said centers and a tension upon said spring.

4. In a sound reproducer, a stylus bar mounted to oscillate on an anti-friction bearing, a spring rigidly connected to said stylus bar and extending transversely therefrom in the plane of the axis of oscillation thereof, and means for exerting a force upon said spring in a direction away from said bar to hold said bar upon said bearing.

5. In a sound reproducer, the combination with the diaphragm, of a stylus bar phonetically connected to said diaphragm and mounted to oscillate upon an anti-friction bearing, a spring connected to said stylus bar and a yielding lug connected to said spring

for holding said bar in engagement with said bearing, said spring being substantially in a plane transverse to said bar at its axis of oscillation.

6. In a sound reproducer, the combination with the diaphragm of a stylus bar mounted to oscillate upon centers, a spring connected to said bar, a yielding lug for holding said bar on its centers, said spring being substantially in the plane of the axes of said centers, said lug and spring being adjustably connected to vary the tension exerted upon said spring.

7. In a sound box, an L-shaped stylus holder mounted to oscillate, one arm of said holder forming a spring and means for producing a tension upon said spring.

8. In a sound reproducer, a stylus bar mounted to oscillate upon pivot bearings, a spring extending substantially at right angles to said bar and rigidly connected thereto and means for exerting a force away from and in the plane of the axis of oscillation, to produce a tension upon said spring and to hold the bar in engagement therewith.

9. In a sound recording and reproducing machine, a stylus bar, a spring for regulating the freedom of movement of the stylus bar, said spring being reduced in cross section for a portion of its length, and a nut for tensioning the spring, said nut having a bearing upon the casing of the sound box.

10. In a sound recording and reproducing machine, a stylus bar, a spring integral with said bar and extending substantially perpendicular thereto, for regulating the freedom of movement of the stylus bar, said spring being reduced in cross section for a portion of its length, and a nut for tensioning the spring, said nut having a bearing upon the casing of the sound box.

11. In a sound reproducer, a stylus bar mounted to oscillate on an axis transverse thereto, a projection extending at right angles to said bar, a yielding lug adapted to engage the end of said projection and means for adjusting the relation between said lug and said projection.

12. In a sound reproducer, a stylus bar mounted to oscillate on an axis transverse thereto, a projection extending at right angles to said bar, a yielding U-shaped lug adapted to engage the end of said projection and means for adjusting the relation between said lug and said projection.

13. A sound box comprising a casing provided with a recess, a cover therefor extended to enter said recess, a diaphragm carried by said casing, a stylus bar mounted to oscillate upon the cover extension, one end of said bar being phonetically connected to said diaphragm and the other end of said bar having means for holding a stylus, a spring

connected to the stylus bar at a point in the plane of its axis of oscillation, and a means bearing upon the cover extension for regulating the tension of said spring.

14. In a sound box machine, a recessed casing, a cover having an approximately U-shaped extension entering the recess, a rocking stylus bar mounted to oscillate upon the cover, a spring arm integral with the bar and projecting through apertures provided therefor in said U-shaped extension, and a nut engaging the projecting end of the spring arm.

15. In a sound box, the combination with a diaphragm, of a coating of sound insulating material applied to one or more of the opposing marginal edges thereof, said coating consisting of fibers loosely cemented in place.

16. In a sound reproducer, a stylus bar mounted to oscillate on an axis transverse thereto, a spring rigidly connected to said bar, and means for exerting force in a direction longitudinally of said spring in the plane of the axis of oscillation of said bar transverse to said stylus bar, to produce a tension on said spring.

17. In a talking machine, a stylus bar, a bearing upon which said bar is mounted, a spring connected transversely to said bar and caused to flex by the oscillation of said bar, and means acting longitudinally of said spring to hold said bar upon said bearing.

18. In a talking machine, a stylus bar, a bearing for said bar, a spring rigidly connected transversely to said bar, and means acting longitudinally of said spring to hold said bar on said bearing.

19. In a talking machine, a stylus bar, a bearing upon which said bar is mounted, a spring rigidly connected to said bar, and yielding means acting longitudinally of said spring to tension said spring to hold said bar on said bearing.

20. In a sound box, a casing having a body portion provided with a diaphragm chamber having an annular seat therein, a diaphragm supported by said seat, and a cover extending over the front face of said body member and having an annular bead integral therewith upon the inner face thereof to hold said diaphragm in place.

21. In a sound box, a casing having a body portion provided in the face thereof with a diaphragm chamber having an annular seat therein, a diaphragm supported by said seat, a cover extending over the front of said body member to hold said diaphragm in place, and fibers loosely cemented between said casing and said diaphragm.

22. In a sound box, the combination with a stylus bar, of a spring for tensioning said bar, said spring having a part thereof re-

duced in cross section, and means acting longitudinally of said spring for tensioning the same to influence the oscillation of said bar.

23. In a sound box, the combination with a diaphragm, of a seat therefor, and sound insulating fiber interposed between the diaphragm and its seat and loosely cemented in place.

24. In a sound box, the combination with a diaphragm, of a seat therefor and sound insulating material interposed between the diaphragm and its seat and loosely cemented in place.

25. In a sound box, the combination with a diaphragm, of a coating of sound insulating material loosely cemented thereto.

26. In a sound box, the combination with a diaphragm, of a coating of sound insulating fiber loosely cemented thereto.

27. In a sound box, the combination with a casing, of a cover therefor, a stylus bar mounted to oscillate upon said cover, and means extending through said cover to hold said bar in place.

28. In a sound box, the combination with a casing, of a stylus bar mounted upon the outside of said casing, and means extending longitudinally through said casing to hold said bar in place.

29. In a sound box, the combination with a casing, of a stylus bar mounted on the outside of said casing, and means extending through said casing and transversely of said bar for holding said bar in place.

30. In a sound box, the combination with a casing, of a cover therefor provided with an opening and with bearings upon opposite sides of said opening on the front of said cover, a stylus bar engaging said bearings, and means extending through said opening to hold said bar in place.

31. In a talking machine, a stylus bar mounted to oscillate, and a spring connected to said bar and extending transversely thereof and caused to flex by the oscillation thereof to influence said oscillation.

32. In a talking machine, a stylus bar mounted to oscillate, a spring connected to said bar and caused to flex by the oscillation thereof, and yielding means to tension said spring.

33. In a sound box, the combination with a stylus bar, of a mounting therefor, an arm rigidly connected to said bar, and yielding means surrounding said arm to hold said bar upon its mounting.

34. In a talking machine, a stylus bar mounted to oscillate, and a spring rigidly connected transversely to said bar, and caused to flex thereby for influencing the oscillation thereof.

35. In a talking machine, a stylus bar mounted to oscillate, a flexible spring rig-

idly connected transversely to said bar, and means acting longitudinally of said spring to tension the same.

36. In a sound box, the combination with a casing, of a diaphragm mounted therein, and a cover for said casing having an annular bead integral therewith to hold said diaphragm in place.

37. In a sound box, the combination with a casing, of a diaphragm carried thereby, and a cover for said casing having a projection integral therewith to hold said diaphragm in place.

38. In a sound box, the combination with a stylus bar, of an arm rigidly connected to said bar, and extending transversely thereof, and yielding means surrounding said arm to hold said bar upon its mounting.

39. In a sound box, the combination with a stylus bar, of an arm connected to said bar and extending transversely thereof, and yielding means surrounding said arm to tension said arm.

40. In a sound box, a stylus bar mounted to oscillate, an arm connected to said bar and extending transversely thereof in the plane of the axis of oscillation thereof, and yielding means surrounding said arm to tension said arm.

41. In a sound box, the combination with a stylus bar, of an arm connected thereto, and extending substantially in the plane of the axis of oscillation of said bar, and yielding means surrounding said arm to tension said arm.

42. In a sound box the combination with a casing, of a stylus bar mounted thereon, and means inclosed by said casing for holding said bar upon its mounting.

43. In a sound box the combination with a casing, of a stylus bar mounted upon the face thereof, and means extending rearwardly from said bar to hold said bar upon its mounting.

44. In a sound box the combination with a casing, of a stylus bar mounted to oscillate upon the face thereof, and means extending rearwardly from said bar and substantially in a plane with the axis of oscillation thereof for holding said bar upon its mounting.

45. In a sound box the combination with a casing, of a cover therefor having a lug integral therewith, a stylus bar mounted to os-

cillate upon said cover, and means between said bar and said lug to hold said bar upon its mounting.

46. In a sound box the combination with a casing, of a cover therefor having a yielding lug projecting therefrom, a stylus bar mounted to oscillate upon said cover, and means between said bar and said lug to tension said bar.

47. In a sound box the combination with a casing, of a cover therefor provided with a rearwardly extending yielding lug and a stylus bar mounted upon said cover, and means between said stylus bar and said lug for tensioning said bar.

48. In a sound box the combination with a casing, of a cover therefor, a stylus bar mounted to oscillate on said cover, and a spring having a part thereof reduced in cross section between said bar and said cover for holding said bar upon its mounting.

49. In a sound box the combination with a casing, of a cover therefor having an apertured lug projecting therefrom, a stylus bar mounted to oscillate upon said cover, and means connected to said bar and extending through the aperture in said lug for holding said bar upon its mounting.

50. In a sound box the combination with a casing, of a cover therefor provided with a lug having an aperture, of a stylus bar mounted upon said cover, a spring rigidly connected to said bar and extending through said aperture, and means between said spring and said lug for adjusting the tension of said spring.

51. In a sound box the combination with a casing, of a cover therefor provided with a lug having an aperture, of a stylus bar mounted upon said cover, a spring rigidly connected to said bar and extending through said aperture, and a nut between said spring and said lug for adjusting the tension of said spring.

52. The combination with a stylus bar, of a mounting therefor, an arm connected to said bar and means surrounding said arm to hold said bar upon its mounting.

LOUIS P. VALIQUET.

Witnesses:

JOHN F. GRODER,
HARRY COBB KENNEDY.

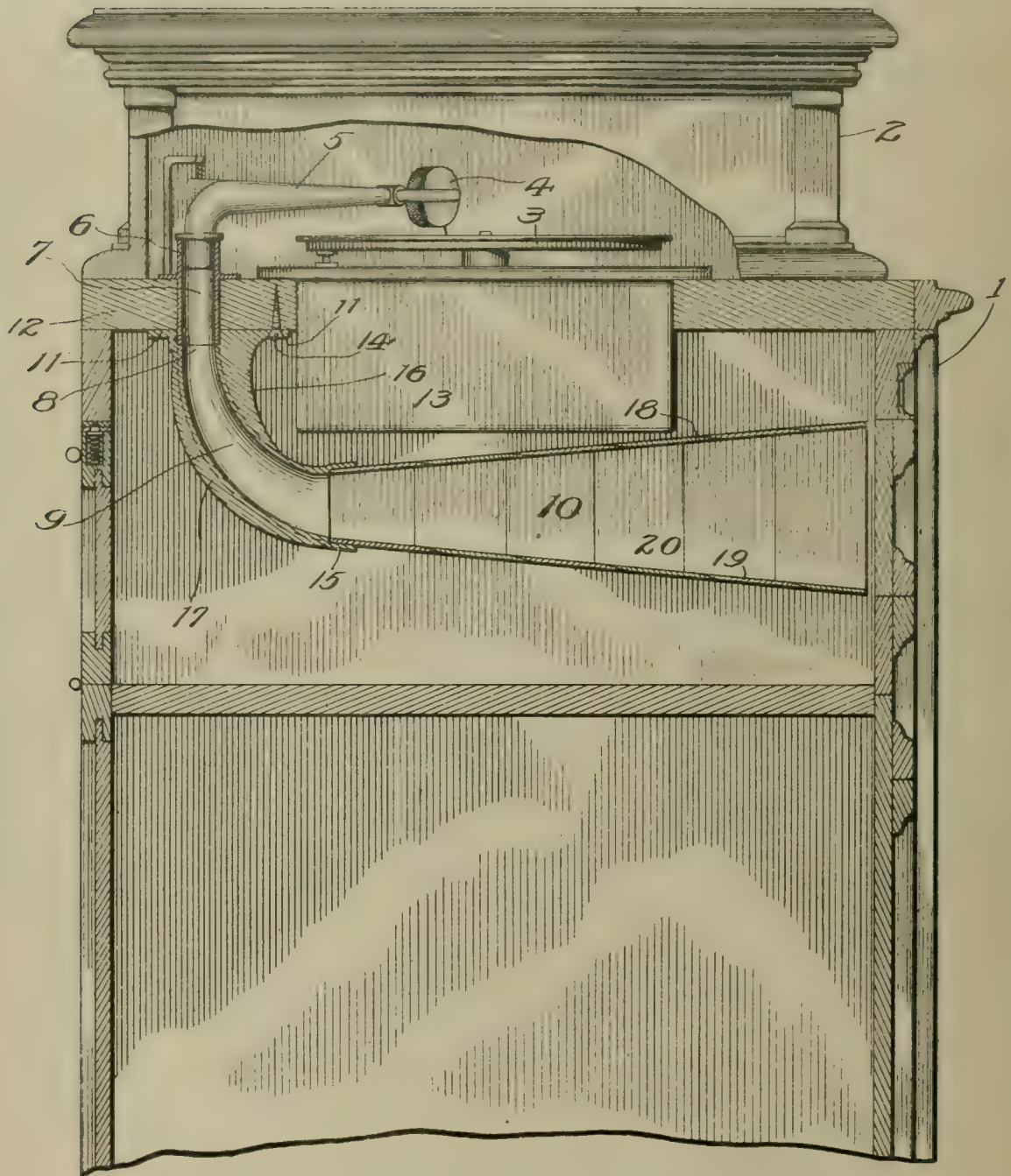
J. C. ENGLISH.
SOUND REPRODUCING DEVICE.
APPLICATION FILED JULY 19, 1906.

947,227.

Patented Jan. 25, 1910.

2 SHEETS—SHEET 1.

Fig 1.



WITNESSES:

H. J. Hartman.
Alvin J. Moulton

INVENTOR

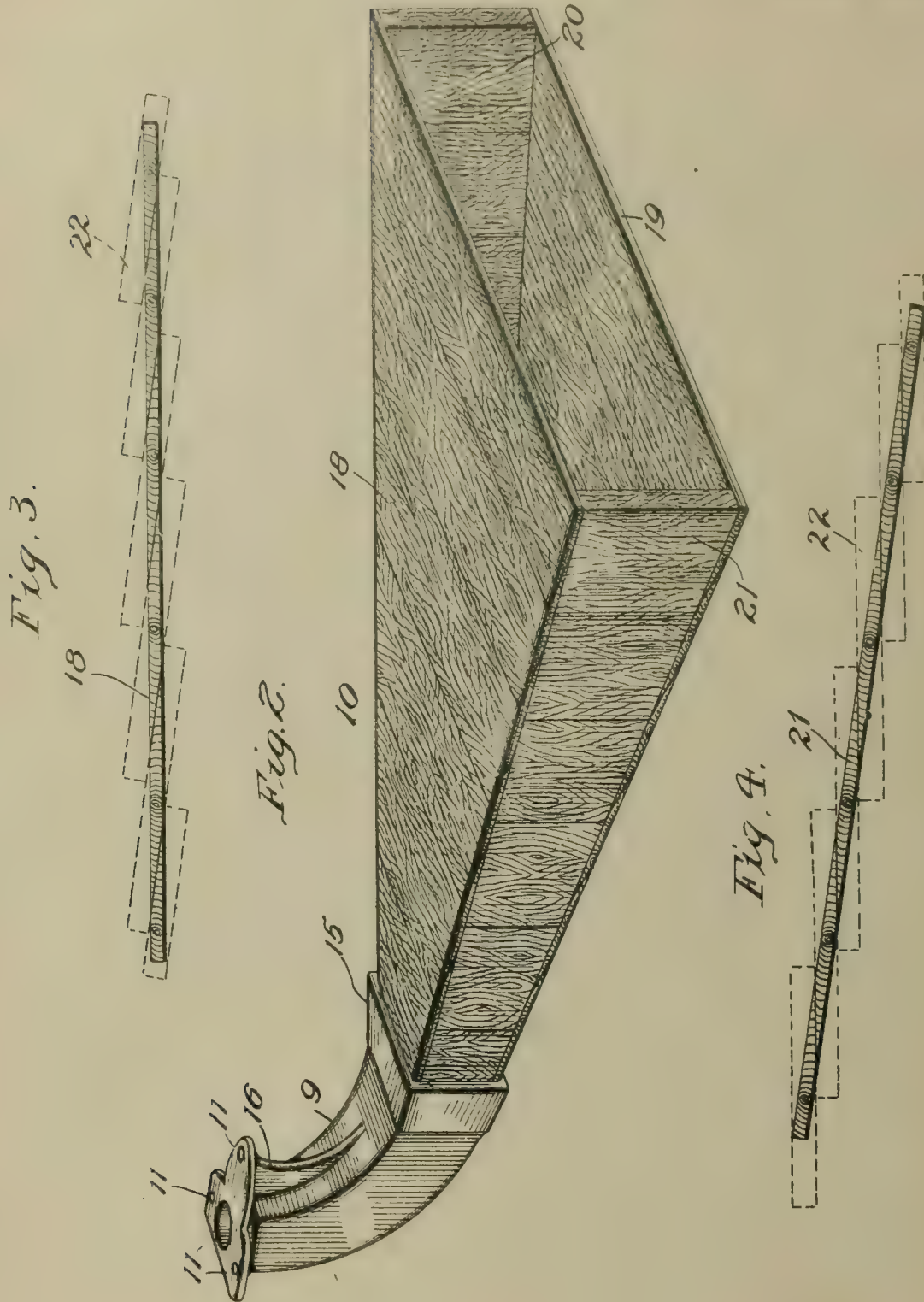
John C. English.
BY *John C. English.*
ATTORNEY.

J. C. ENGLISH.
SOUND REPRODUCING DEVICE.
APPLICATION FILED JULY 19, 1906.

947,227.

Patented Jan. 25, 1910.

2 SHEETS—SHEET 2.



WITNESSES:

F. J. Hartman
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UNITED STATES PATENT OFFICE.

JOHN C. ENGLISH, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-REPRODUCING DEVICE.

947,227.

Specification of Letters Patent.

Patented Jan. 25, 1910.

Application filed July 19, 1906. Serial No. 326,827.

To all whom it may concern:

Be it known that I, JOHN C. ENGLISH, a citizen of the United States, and a resident of Camden, State of New Jersey, have invented certain new and useful Improvements in Sound-Reproducing Devices, of which the following is a full, complete, and exact disclosure.

My invention relates to sound reproducing devices and especially to those devices which are used to augment or amplify the sounds which are being reproduced from a record.

The object of my invention is to dispense with the ordinary megaphone, sound amplifying-trumpet, or horn which is usually used to amplify the sounds reproduced by talking machines, and to increase the volume of the tones by means of an amplifier having sound boards which are caused to vibrate in sympathy with the vibration of the air conducted between the same from the sound conveying tube.

A further object of my invention is to convey the vibrations from the reproducer to the sound amplifying device without loss, and then to allow the said vibrations to emerge between the sound boards of the amplifier.

A further object of my invention is to support the amplifier at one end only so that the sound boards may be free to respond to the vibrations imparted to them from the sound reproducer.

A further object of my invention is to make the sound boards used in connection with my sound amplifying device resonant in order to cause the same to readily vibrate in sympathy with the air inclosed between the same.

Other objects of my invention will appear in the specification and claims below.

In the accompanying drawings forming a part of this specification, in which similar parts are referred to by the same reference characters, Figure 1 illustrates a sound reproducing device provided with my improved sound amplifier, the main portions of the same being shown in cross section; Fig. 2 is a perspective view of my improved sound augmenting device; Fig. 3 is a diagrammatic view showing the method employed by me to make the sound boards of the sound amplifying device resonant, and Fig. 4 is a view similar to Fig. 3 showing the method of

constructing the inner sides of my improved device.

Referring to the drawings, one embodiment of this invention comprises a casing or talking machine cabinet 1 upon the top of which is the housing 2, which contains the turntable 3, the reproducer 4 and the swinging arm 5. The larger end of the tapering swinging reproducer arm 5 is pivoted as at 6 to a hollow bushing 7 which communicates with the smaller end 8 of a hollow bracket, or elbow 9, the opposite end of which is adapted to support my sound amplifying device 10.

The bracket 9 or sound conductor consists of a rigid hollow structure, curved longitudinally through an arc of about 90 degrees, the smaller end of which is provided with a plate 11 integral therewith by which the same is rigidly secured by means of screws 14 to the thick partition 12 which supports the talking machine motor 13. The smaller end of the opening in this bracket is substantially circular in cross section and registers with the circular opening in the bushing 7, and, from the point of connection between the bushing and the bracket, this bracket increases in size and terminates in an enlarged rectangular oblong outwardly flaring socket 15. The opening through the bracket also increases in transverse sectional area downwardly and gradually changes in shape from circular at its upper end, to the oblong shape of the socket at its lower end. I make this bracket 9 very rigid, so that the same will not be set into vibration by the sounds conveyed therethrough, by rigidly securing the same to the thick top 12 of the cabinet, and by bracing the same by webs 16, 17 at the front and back sides of the same respectively. If desired, the bracket may be made of such proportions that the bracing is unnecessary to prevent the vibration of the same. I preferably make the bracket 8 of metal, since a metal bracket may be made sufficiently rigid for my purposes, but any material may be employed by me so long as the same will resist the tendency to vibrate in sympathy with the vibrations of the air contained therein and support the sound boards.

Within the larger end of the sound conveying bracket 9, I support the smaller end of the major portion of my sound amplifying-

ing device, the same consisting of a hollow flattened tapering body 10, having resonant wooden sides. The top and bottom sides 18 and 19 of this body, are made of thin resonant substantially flat wooden boards, the outer edges of which overlap and are secured in any suitable manner to the edges of vertically arranged substantially flat wooden supporting boards 20, 21.

The top and bottom sound boards 18, 19 are spaced apart from each other and may be substantially parallel, or may diverge from their point of attachment with the rigid bracket 9, but the vertical sides of the resonant body preferably diverge considerably, the outer ends of the same being spaced apart nearly the full width of the talking machine cabinet.

While the four sides of the body of the amplifying device, may be made thin and resonant, I prefer to make the upper and lower sound boards, 18, 19, of thin resonant material, and the sides 20, 21 of thick and comparatively non-resonant material.

To give a pleasing resonant quality to the upper and lower sound boards 18, 19, I construct the same in the manner indicated in Fig. 3; that is to say, I build up and glue together a series of boards 22, so that the sound board which is to be formed from the same will cross the lines upon which the boards 22 are glued together at an acute angle, as plainly shown in said Fig. 3. I then saw or otherwise cut out of the series of boards 22 glued together, the sound boards 19 or 20, as the case may be, with the result that the finished sound boards are composed of a plurality of sections of wood, cut parallel to the grain, the said pieces being glued together for a considerable distance, notwithstanding the fact that the finished sound board is very thin. As plainly shown in all the figures and as above described, the sound boards may be described as being composed of a structure composed of substantially overlapping scarfed wooden strips, the direction of the grain thereof, being transverse to the length of the resonator.

If desired, I may make the sides 20, 21 of wooden strips similar to the sides 18, 19, as plainly shown in Fig. 4, although the sides 20, 21 may be thick and non-resonant as above described.

I have found that a sound amplifying device constructed and arranged in the manner above described, effects a loud and mellow, but brilliant reproduction of the sound, in addition to taking up less space than that which is ordinarily required in the amplifying horns usually employed in connection with talking machines. I have also found that a sound amplifying device in which the

upper and lower sound boards are nearly parallel, will effect as loud a reproduction of the sound as a megaphone or an ordinary tapering horn 12 inches across the bell thereof, and that the sound reproduced is of a much more pleasing quality than that from a horn or megaphone of the ordinary type above referred to.

The sound waves set into vibration by the reproducer are transmitted through the rigid swinging sound conveying tube 5 and through the rigid bracket 9, out and between the thin resonant sound boards of my improved sound amplifying device, these boards being set into sympathetic vibration with and by the waves being conducted therethrough and by the vibration of these sound boards, the sounds corresponding to the vibrations being reproduced, are greatly augmented or amplified. By thus using in the talking machine an amplifier comprising a tapering longitudinally curved rigid bracket having an opening therethrough which is substantially circular at its inlet end and oblong at its outlet end which opens between the transversely oblong body portion of the amplifier, it is possible to convey the sound waves from the sound box to the resonant body of the amplifier without loss of energy, and to utilize, with a high degree of efficiency, comparatively broad sound boards, without taking up much space vertically in the cabinet of the machine. By making the body of the amplifier oblong and comparatively broad horizontally but narrow vertically, it is thought that a desirable quality is obtained in reproducing sound.

Although only one form has been herein illustrated in which this invention may be embodied, it is obvious that many changes may be made in the construction shown without departing from the spirit of the invention or the scope of the appended claims.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:—

1. In a talking machine, the combination with a vertical cabinet, of a hollow, longitudinally curved rigid support rigidly secured to said cabinet and depending downwardly therein, a sound amplifier entirely supported at one end by one end of said support and communicating therewith, and a reproducer communicating with the other end of said bracket.

2 In a talking machine, the combination with a vertical cabinet having an opening in one side thereof, of a hollow, rigid longitudinally curved bracket rigidly secured to said cabinet and depending downwardly therein, a hollow sound amplifier oblong in transverse section entirely supported at one

end by one end of said bracket and communicating therewith, the free end of said amplifier terminating within said cabinet and adjacent the opening in the side thereof, and a reproducer connecting with the other end of said bracket.

3. In a talking machine, the combination with a reproducer, of a sound amplifying device comprising a plurality of strips extending transversely of said body, and having overlapping edges forming a substantially scarfed sound board.

4. In a talking machine, the combination with a reproducer, of a sound amplifying device comprising a plurality of strips in the same plane and having acute overlapping edges forming a substantially scarfed sound board.

5. In a talking machine, the combination with a casing, of a rigid hollow bracket secured at one end to said casing, said bracket being provided with a substantially circular opening at one end, and with an oblong opening at its opposite end, and a sound amplifier of oblong transverse section secured over said oblong opening and entirely supported by said bracket.

6. In a talking machine, the combination with a casing, of a rigid hollow bracket secured at one end to said casing and depending downwardly therein, said bracket being provided with a substantially circular opening at its upper end, and with an oblong opening at its lower end, and a sound amplifier of oblong transverse section within said casing, secured over said oblong opening and entirely supported by said bracket.

7. In a talking machine, the combination with an inclosing casing, of a sound amplifying device comprising a hollow body, a reproducer, and a rigid hollow bracket connecting the reproducer and the hollow body and having an end oblong in cross section rigidly supporting said body at one end.

8. In a talking machine, the combination with an inclosing casing, of a sound amplifying device comprising a flattened tapering hollow resonant body rectangular in cross section, a rigid hollow bracket communicating therewith and having a transversely oblong end supporting said body at one end, and a reproducer communicating with said bracket.

9. In a talking machine, the combination with an inclosing cabinet, of a reproducer, a hollow body having sides adapted to vibrate sympathetically with the sounds passing through said body, and a rigid hollow bracket connecting the reproducer and the said body and having an oblong outlet communicating with said body.

10. In a talking machine, the combination with a reproducer of a sound ampli-

fying device comprising a hollow body substantially in the form of a truncated pyramid and having scarfed sides, extending transversely of said body and means to support said body at its smaller end.

11. In a talking machine, extending transversely of said body a sound amplifying device comprising a hollow body substantially in the form of a truncated pyramid and having scarfed resonant sides extending transversely of said body, and means to support said body rigidly at its smaller end.

12. In a talking machine, the combination with an inclosing cabinet, of a sound amplifier having scarfed resonant sides extending transversely of said body, said amplifier being mounted at one end, and a reproducer communicating with the said mounted end of the said amplifier.

13. The combination in a talking machine, of a casing, a motor, a turntable and a sound conveying tube, all inclosed within said casing, of a resonator oblong in cross section, also inclosed within said casing and located beneath said motor, and a hollow rigid bracket having an oblong end communicating with said resonator.

14. In a talking machine, an amplifier comprising a hollow sound conveying rigid bracket, a sound box communicating with one end of said bracket and a resonator communicating with the other end of said bracket.

15. In a talking machine, the combination with a cabinet, of a transversely oblong hollow amplifying body in said cabinet, and a hollow rigid bracket having a transversely oblong end supporting one end of said body and communicating therewith.

16. In a talking machine, the combination with a cabinet, of amplifying means within said cabinet comprising a hollow transversely oblong body having substantially flat resonant sides, and a rigid bracket rigidly secured within said cabinet and having a tapering opening therethrough, one end of said opening being substantially oblong transversely and communicating with said hollow body.

17. In a talking machine, the combination with a cabinet, of a hollow transversely oblong amplifying body within said cabinet, and a hollow rigid bracket rigidly supported in said cabinet and having one end provided with a substantially oblong socket supporting said body.

18. In a talking machine, the combination with a cabinet, of a hollow longitudinally curved support rigidly secured to said cabinet and extending downwardly therein, a sound amplifier comprising a hollow resonant body entirely supported at one end by one end of said support and communi-

ating therewith, and a reproducer communicating with the other end of said support.

19. In a talking machine, the combination with a casing, of a rigid hollow bracket secured at one end to said casing, said bracket being provided with a substantially circular opening at one end and with an oblong opening at its opposite end, and a hollow resonant sound amplifier oblong in transverse section communicating with said bracket through the oblong opening therein and entirely supported by said bracket.

20. In a talking machine, the combination with a casing, of a hollow longitudinally curved rigid bracket rigidly secured to said cabinet and depending downwardly therein, a hollow resonant sound amplifier entirely supported at one end by one end of said bracket and communicating therewith, and extending in a substantially horizontal direction therefrom, and a reproducer communicating with the other end of said bracket, said amplifier being entirely inclosed by said casing but out of contact therewith.

21. In a talking machine, the combination with a casing, of a hollow rigid bracket rigidly secured to said cabinet and extending downwardly therein and terminating in an oblong socket, and a resonant hollow sound amplifier having an oblong end secured in said oblong socket.

22. In a talking machine, an inclosure, the combination with a reproducer of an amplifier comprising a hollow, rigid, substantially non-vibratory sound conductor rigidly mounted within said inclosure, said sound reproducer communicating with one end of said conductor, and a sounding board entirely inclosed within said inclosure and communicating with the other end of said conductor.

23. In a talking machine, the combination with an inclosure of a hollow amplifying body substantially rectangular in cross section, and a hollow rigid sound conducting member secured within and to said inclosure and communicating with the interior of said body.

24. In a talking machine, the combination with an inclosure of a reproducing mechanism, a swinging arm communicating with said reproducing mechanism and pivotally mounted within said inclosure, a hollow wooden amplifier substantially rectangular in cross section inclosed by said inclosure, and a rigid sound conducting member secured within said inclosure and provided with an opening extending through said member, one end of said opening being circular and communicating with said swinging arm and the opposite end of said open-

ing being rectangular and communicating with said amplifier.

25. In a talking machine, the combination with an inclosure of a reproducing mechanism, a swinging arm secured thereto and pivotally mounted in said inclosure, an amplifier mounted within said inclosure and comprising a wooden hollow portion substantially rectangular in cross-section and a heavy substantially non-vibratory metallic portion secured to said inclosure, said heavy portion having an opening therethrough, said opening being circular at one end and communicating with said swinging arm, and rectangular at its other end and communicating with said amplifier.

26. In a talking machine, the combination with a casing of a hollow rigid sound conducting member secured to said casing and extending downwardly therein, terminating in a rectangular end, and a hollow sound amplifier having a rectangular end communicating with the said rectangular end of said sound conducting member.

27. In a talking machine, the combination of a cabinet provided with a sound outlet opening, sound reproducing means within said cabinet, a rigid hollow substantially non-vibratory sound conducting member mounted within said cabinet and having one end in communication with said reproducer, and a sounding board mounted within said cabinet and arranged between the other end of said sound conducting member and said opening in said cabinet.

28. In a talking machine, the combination of a cabinet, a sound reproducing mechanism within said cabinet, a rigid hollow substantially non-vibratory sound conducting member secured within said cabinet, and a plurality of spaced sounding boards mounted within said cabinet, with the space between said boards communicating with said opening in said conductor, said cabinet being provided with an opening adjacent the outer ends of said sounding boards.

29. In a talking machine, the combination with a cabinet, a motor, a sound reproducer, and a sound conveyer, inclosed within said cabinet, of a substantially rectangular hollow sound amplifying body mounted within and stationary with respect to said cabinet, one of the outer sides of said body being a sounding board.

30. In a talking machine, the combination with a cabinet of a substantially rectangular hollow sound amplifying body mounted within said cabinet, one of the outer sides of said body being a sounding board, and a rigid non-vibratory sound conductor, said hollow body being supported at one end only by said conductor.

31. In a talking machine, the combination

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with sound reproducing means, of a stationary amplifier, the major portion of which has cross sectional axes of substantially different lengths connected therewith, and an inclosure embracing the major portion of the amplifier.

32. In a talking machine, the combination with sound reproducing means, of a stationary amplifier, the major portion of which is oblong in cross section connected therewith, and an inclosure, the major portion of the amplifier being mounted within said inclosure in a fixed position.

33. The combination with sound reproducing means, of a cooperating amplifier having a curved throat and diverging side walls, an inclosure embracing the major portion of the throat and walls of said amplifier, said inclosure being provided with an opening opposite the delivery end of said amplifier, said delivery end being out of engagement with and unattached to said inclosure.

34. In combination with sound reproducing means, of a flattened amplifier located below said reproducing means, and means to convey the sound from said reproducer to said amplifier.

35. The combination with sound reproducing means, of an amplifier the axes of the major portion of which are of substantially different lengths, and substantially non-vibratory means to conduct the sound from said reproducing means to said amplifier.

36. The combination with sound reproducing means, of an amplifier oblong in cross section and located below said sound reproducing means and means to conduct the sound from said sound reproducing means to said amplifier.

37. The combination with sound reproducing means, of a plurality of sounding boards spaced apart from each other and located below said sound reproducing means and means to conduct the sound from said reproducing means between said sounding boards.

38. The combination with sound reproducing means of a cooperating amplifier, and an inclosure entirely embracing said sound reproducing means and said amplifier, and supporting said amplifier at one end only, said inclosure being provided with an opening in a side thereof and adjacent the delivery end of said amplifier.

39. The combination with sound reproducing means, of a cooperating amplifier, an inclosure entirely embracing said sound reproducing means and said amplifier and supporting said amplifier at one end only, said inclosure being provided with an opening in a side thereof and adjacent the delivery end of said amplifier, and a closure for said opening.

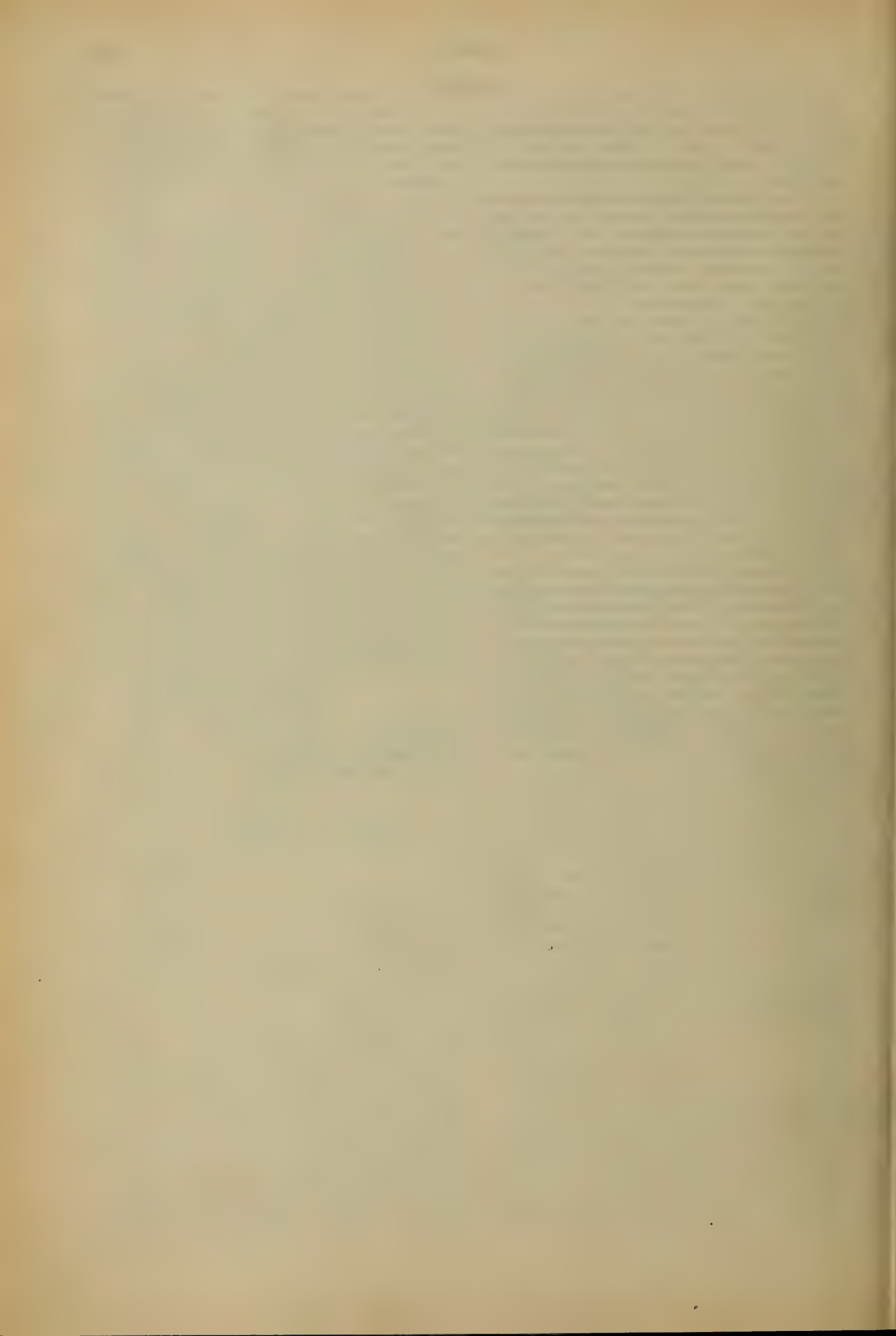
40. The combination with sound reproducing means, of a cooperating amplifier having a substantially non-vibratory smaller end and a vibratory larger end, an inclosure entirely inclosing said sound reproducing means and said amplifier and rigidly supporting said amplifier at its smaller end only.

In testimony whereof, I have hereunto set my hand this 18th day of July, A. D. 1906.

JOHN C. ENGLISH.

Witnesses:

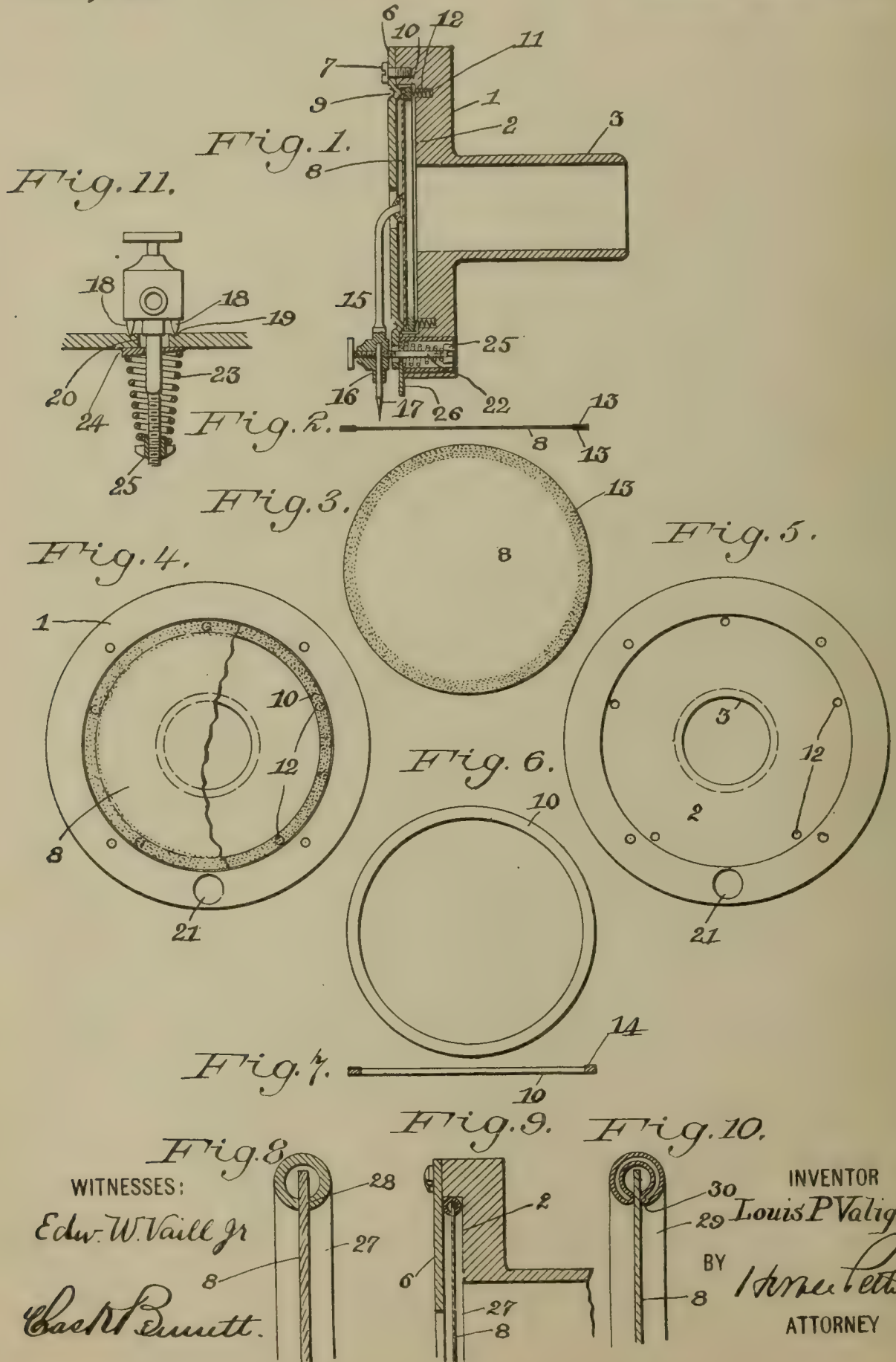
ALSTON B. MOULTON,
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L. P. VALIQUET.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED OCT. 28, 1903. RENEWED NOV. 5, 1909.

947,534.

Patented Jan. 25, 1910.



WITNESSES:

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VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-BOX FOR TALKING-MACHINES.

947,534.

Specification of Letters Patent.

Patented Jan. 25, 1910.

Application filed October 28, 1903. Serial No. 178,933. Renewed November 5, 1909. Serial No. 526,471.

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a resident of the city of New York, State of New York, have invented certain new and useful Improvements in Sound-Boxes for Talking-Machines, of which the following is a full, clear, and complete disclosure.

The main objects of this invention are, to provide in a sound box for talking machines, an improved mounting for a stylus bar; to provide an improved mounting for a diaphragm; and to provide other improvements as will appear hereinafter.

In the accompanying drawings, which illustrate a preferred embodiment of my invention,—Figure 1, is a central longitudinal section of a sound-box constructed in accordance with my invention. Fig. 2, is a cross-section of the diaphragm; Fig. 3, is a face view thereof; Fig. 4, is a front elevation of the sound-box with the cover and stylus-holding arm removed and with the diaphragm partially broken away; Fig. 5, is a front elevation of the sound-box with the cover stylus-holding bar and diaphragm removed; Fig. 6, is a face view of a ring for supporting the diaphragm; Fig. 7, is a cross-section thereof; Fig. 8, is a cross-section of a portion of the diaphragm and a flexible ring for supporting the same; Fig. 9, is a cross section of a portion of the sound-box with the diaphragm support shown in Fig. 8 applied thereto; Fig. 10, is a cross section of a portion of the diaphragm and a flexible spring ring for supporting the same and showing another construction embodying my invention; and Fig. 11, is a view, partially in elevation and in section, illustrating an adjustable rocking support for the stylus-holder, being an enlarged view of certain parts shown in Fig. 1.

Referring to these drawings, the body 1 of the sound-box is recessed, as shown at 2, to form a diaphragm chamber, and is provided with a tube 3, extending rearwardly for connection with the usual trumpet or horn.

A cover 6 is removably secured to the front of the sound-box, conveniently by screws 7, and serves as a retainer for the

diaphragm 8, being provided with an annular bead 9 on its inner side, that contacts with the front face of the diaphragm near its edge. In the construction shown in Figs. 1 to 7, I provide a yielding cushion as a support for one side of the diaphragm, and in the construction illustrated, this support comprises a ring 10 contacting with the edge portion of the rear face of the diaphragm and yieldingly supported by a plurality of springs 11, mounted in recesses 12 in the rear of the diaphragm chamber, as shown in Fig. 1. The said ring 10 is situated opposite the bead 9, and the side faces of the diaphragm are held between this bead 9 and the ring 10.

As shown in Figs. 2 and 3, I prefer to employ an insulating annulus 13, which is interposed between the diaphragm and the bead 9 and ring 10 between which the diaphragm is held, said annulus being of non-sonorous material, such, for example, as felt fiber, and is preferably applied to one or both of the opposing faces in the form of an adhering coating.

As shown in Figs. 1 and 7, the ring 10 may be provided with an insulating coating or annulus 14 on the face thereof contacting with the diaphragm. In this way the diaphragm is flexibly supported so that it is extremely sensitive and reproduces with a high degree of efficiency the vibrations of the stylus which are conveyed thereto by the stylus holder 15.

The stylus holder 15 is approximately L-shaped, as shown in Fig. 1, the upright arm 16 thereof being provided with a socket for the stylus 17, and with the usual means for holding the same in place. The upper end of the arm 16 is curved and projects through a central opening in the cover 6 toward the diaphragm, to which it is attached in any well-known manner.

The stylus holder 15 is movably mounted upon the sound-box cover, being fulcrumed preferably by means of twin points or studs 18, projecting rearwardly from the arm 16, and seated in depressions 19 in the cover 6, as shown in Fig. 11. The studs 18 are spaced equidistant upon each side of an opening 20 in the sound-box cover, which is

located over a socket 21 in the lower portion of the body of the sound-box, and the horizontal arm 22 of the stylus holder projects through said opening 21 into said socket.

For the purpose of holding the stylus holder in engagement with the diaphragm in a sensitive manner and under tension, and also for varying the tension or pressure upon the diaphragm, I employ a spring 23 that encircles the arm 22, and in Figs. 1 and 11, is situated between a cam 24 resting against the rear face of the cover 6 at the front of the socket 21, and an adjustable nut 25 having screw-threaded engagement with the rear end of the arm 22, said spring being cone-shaped with its base resting against the cam 24. The nut 25 may be constructed to be turned by a suitable tool, or it may be milled, and obviously can be employed to adjust the tension of the spring 23 so as to vary the pressure, with which the stylus-holder arm 16 engages the diaphragm. The cam 24, referred to, is provided with a handle 26 by which it may be turned and its inclined face, upon which the base of the spring 23 bears, serves also to adjust the tension of the spring independently of the adjustment attained by the nut 25.

The spring ring shown in Fig. 1 exerts a uniform pressure upon the diaphragm throughout its circumference, but upon one side only, and in Figs. 8, 9 and 10, I have shown a construction for exerting a uniform and yielding pressure upon both sides of the diaphragm around its peripheral portion within and adjacent to its circumferential edge or wall of a flexible spring ring with a recess throughout its inner circumference to provide a seat for the peripheral portion above referred to of the diaphragm. In Figs. 8 and 9, this flexible spring ring 27 is in the form of a tube slit throughout its inner circumference, as shown at 28, with the peripheral portion of the diaphragm 8 seated within the slit portion, while the slit portion of the ring 27 engages both faces of the diaphragm. In Fig. 9, a diaphragm so supported is shown in position within the sound-box, the ring 27 lying within the diaphragm chamber 2, and held in place by the cover 6, which engages the front side of the ring so that the latter is held between the cover 6 and the rear wall of the diaphragm chamber 2.

In Fig. 10, another form of spring ring 29 is shown, which consists of a double walled tube separated throughout its inner circumference with the walls joined at the separated portion, as shown at 30, and with the diaphragm 8 engaged on both faces by the portion of the tube joining the walls, as shown at 30.

It is obvious that various changes might

be made in the details of the constructions shown, without departing from the spirit of this invention or the scope of the appended claims.

Having, therefore, described my invention, what I claim as new, and desire to protect by Letters Patent, is:—

1. In a sound recording and reproducing machine, an L-shaped stylus holder fulcrumed upon the sound-box in operative relation to the diaphragm and having a rocking movement under the direct action of the vibrating stylus carried thereby, a spring encircling the short arm of the holder and having a bearing against the sound-box, and adjusting means for varying the pressure exerted by the holder upon the diaphragm.

2. In a sound recording and reproducing machine, an L-shaped stylus holder fulcrumed upon the sound-box in operative relation to the diaphragm and having a rocking movement under the direct action of the vibrating stylus carried thereby, a spring encircling the short arm of the holder and having a bearing against the sound box, and means for adjusting the short arm to vary the pressure of the long arm upon the diaphragm.

3. In a sound recording and reproducing machine, an L-shaped stylus holder fulcrumed upon the sound-box in operative relation to the diaphragm and having a rocking movement under the direct action of the vibrating stylus carried thereby, a spring encircling the short arm of the holder and having a bearing against the sound-box, and an adjustable cam interposed as a bearing for the spring.

4. In a sound recording and reproducing machine, an L-shaped stylus holder fulcrumed upon the sound-box in operative relation to the diaphragm and having a rocking movement under the direct action of the vibrating stylus carried thereby, a conical spring encircling the short arm of the holder, and an adjustable cam interposed as a bearing for the base of the cone spring.

5. In a sound recording and reproducing machine, an L-shaped stylus holder fulcrumed upon the sound-box in operative relation to the diaphragm and having a rocking movement under the direct action of the vibrating stylus carried thereby, a conical spring encircling the short arm of the holder, a nut upon the threaded extremity of the arm for varying the tension of the spring and an adjustable cam interposed as a bearing for the base of the cone spring.

6. In a sound recording and reproducing machine, a sound-box apertured at or near its circumference, an L-shaped stylus holder fulcrumed upon the sound-box with its short arm lying in the aperture thereof, said holder having a rocking movement about its

fulcrum under the action of the vibrating stylus carried thereby, a conical spring encircling the short arm of said L-shaped holder within the sound-box aperture, a
 5 nut upon the threaded extremity of said arm, and an adjustable cam interposed between the spring and the sound-box.

7. In a sound recording and reproducing machine, a sound-box open at its front end,
 10 a diaphragm adapted to said sound-box, and a flexible spring ring engaging both sides of the diaphragm upon its peripheral portion within and adjacent to its circumferential edge or wall, to retain the same in position,
 15 substantially as described.

8. In a sound recording and reproducing machine, a sound-box open at its front end, a diaphragm adapted to said sound-box, and a flexible spring tubular ring, engaging both
 20 sides of the diaphragm upon its peripheral portion within and adjacent to its circumferential edge or wall, to retain the same in position, substantially as described.

9. In a sound recording and reproducing machine, a sound-box open at its front end, a diaphragm adapted to said sound-box, and a flexible spring ring of C-shaped cross section, engaging both sides of the diaphragm
 25 to retain the same in position, substantially as described.

10. In a sound-recording and reproducing machine, a sound-box open at its front end, a diaphragm adapted to said sound-box and a flexible spring ring recessed throughout its
 35 inner circumference to provide a seat for engaging both sides of the diaphragm upon its peripheral portion within and adjacent to its circumferential edge or wall.

11. In a sound recording and reproducing machine, a sound-box open at its front end, a diaphragm adapted to said sound-box, and a flexible spring tubular ring recessed
 40 throughout its inner circumference to provide for engaging both sides of the diaphragm upon its peripheral portion within and adjacent to its circumferential edge or wall.

12. In a sound recording and reproducing machine, a sound-box open at its front end,
 50 a diaphragm adapted to said sound-box, and a flexible spring tubular ring slit throughout its inner circumference to provide a seat for engaging both sides of the diaphragm upon its peripheral portion within and adjacent
 55 to its circumferential edge or wall.

13. In a sound box, a diaphragm and a tubular hollow ring recessed throughout its inner circumference, the edges of said recess being arranged to engage both faces of the
 60 diaphragm within and adjacent to their circumferential edges or wall.

14. In a sound box open at its front end, a diaphragm and a tubular hollow ring recessed throughout its inner circumference,

the edges of said recess being arranged to
 65 engage both faces of the diaphragm within and adjacent to their circumferential edges or wall.

15. In a sound box, a diaphragm and a tubular resilient hollow ring recessed
 70 throughout its inner circumference, the edges of said recess being arranged to engage both faces of the diaphragm within and adjacent to their circumferential edges or wall.

16. In a sound box, the combination with
 75 a casing, of a stylus bar, mounted to oscillate thereon, an arm rigid with said bar, and a spring encircling said arm and inclosed by said casing to hold said bar upon its mounting.
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17. In a sound box, the combination with a casing, of a stylus bar mounted thereon, an arm rigid with said bar projecting into
 85 said casing, and a spring encircling said arm to hold said bar in position.

18. In a sound box, the combination with a stylus bar, of a mounting therefor, an arm connected to said bar, a conical spring surrounding said arm for holding said bar
 90 upon its mounting, and an adjustable cam interposed between the base of said spring and said mounting.

19. In a sound box, the combination with a stylus bar, of a mounting therefor, an arm connected to said bar, a conical spring surrounding said arm and tapering outwardly
 95 from said bar for holding said bar upon its mounting, and an adjustable cam forming a bearing for the base of said spring.

20. In a sound box, the combination with
 100 a stylus bar, of a mounting therefor, an arm rigid with said bar, a conical spring encircling said arm for holding said bar upon its mounting, and an adjustable cam upon said arm forming a bearing for the base of
 105 said spring.

21. In a sound box, the combination with a stylus bar, of a mounting therefor, an arm rigid with said bar, a conical spring encircling said arm and tapering outwardly from
 110 said bar for holding said bar upon its mounting, and an adjustable cam upon said arm forming a bearing for the base of said spring.

22. In a sound box, the combination with
 115 a stylus bar, of a mounting therefor, an arm, and a cam, and a spring encircling said arm to hold said bar upon its mounting.

23. In a sound box, the combination with a stylus bar, of a mounting therefor, an arm
 120 connected to said bar, a spiral spring encircling said bar to hold said bar upon its mounting, and a cam contacting with said spring to adjust the tension thereof.

24. In a sound box, the combination with
 125 a casing, of a stylus bar mounted thereon, an arm connected to said bar, a spring surrounding said bar and located in said casing

to hold said bar upon its mounting, and a cam contacting with said spring to adjust the tension thereof.

25. The combination with a stylus bar, of
5 a mounting therefor, a spring to hold said bar upon its mounting, and a cam forming a bearing for said spring.

26. The combination with a stylus bar, of
10 a mounting therefor, an arm connected to said bar, a spring carried by said arm, and means movable independently of said arm for adjusting said spring to hold said bar upon its mounting.

27. The combination with a diaphragm, of
15 a mounting therefor comprising a ring recessed about its inner circumference engaging both sides of the diaphragm within and adjacent its periphery.

28. The combination with a diaphragm, of
20 a mounting therefor comprising a resilient ring recessed about its inner circumference engaging both sides of the diaphragm within and adjacent its periphery.

29. In a sound box, the combination with a

diaphragm of a mounting therefor comprising a tubular ring split throughout its inner circumference engaging both sides of the diaphragm adjacent and within its periphery.

30. In a sound box, the combination with a
30 diaphragm of a mounting therefor comprising a tubular ring split throughout its inner circumference and substantially C-shaped in cross section engaging both sides of the diaphragm.

31. In a sound box, the combination with a
35 diaphragm of a mounting therefor comprising a resilient tubular ring split throughout its inner circumference and substantially C-shaped in cross section engaging both sides
40 of the diaphragm.

In witness whereof, I have hereunto set my hand this 20th day of October, 1903.

LOUIS P. VALIQUET.

Witnesses:

JOHN F. GRADY,

HARRY COBB KENNEDY.

W. SANDERSON.

PROCESS OF MAKING RECORDS FOR PHONOGRAPHS, &c.

APPLICATION FILED JULY 14, 1906. RENEWED JUNE 18, 1909.

947,777.

Patented Jan. 25, 1910.

FIG. 1.



FIG. 2.

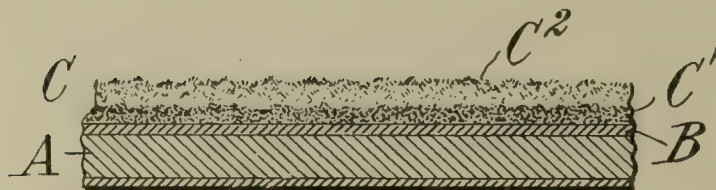
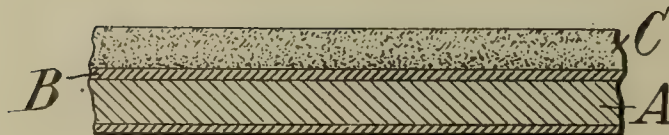


FIG. 3.



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INVENTOR:

William Sanderson,

By Attorneys,

Arthur C. Draser & Maing

UNITED STATES PATENT OFFICE.

WILLIAM SANDERSON, OF NEW YORK, N. Y.

PROCESS OF MAKING RECORDS FOR PHONOGRAPHS, &c.

947,777.

Specification of Letters Patent.

Patented Jan. 25, 1910.

Application filed July 14, 1906, Serial No. 326,201. Renewed June 18, 1909. Serial No. 502,969.

To all whom it may concern:

Be it known that I, WILLIAM SANDERSON, a citizen of the United States, residing in the borough of Brooklyn, in the county of Kings, city and State of New York, have invented certain new and useful Improvements in Processes of Making Records for Phonographs, &c., of which the following is a specification.

10 This invention relates to an improved process of making records for phonographs or the like.

15 This invention is especially directed to a process of making records in disk form, although it is capable of application to other shapes of records.

Disk records for phonographs or other sound reproducing devices are now commonly made of a plastic composition which is impressed with the sound record by a suitable matrix under the action of a hydraulic or other press. Such composition is usually formed in sheets, and during the operation of molding such sheets are placed upon a steam table which renders the composition sufficiently plastic to be worked. The mold, which contains the matrix, is then filled with a suitable quantity of the composition, the operator cutting off a sufficient number of pieces to form the finished record. The mold is then placed under the press and subjected to a pressure of from 60 to 80 tons, during which time the composition receives the impression of the matrix. This process is a comparatively slow and laborious one, and results in a record which is expensive and easily broken.

According to the preferred mode of practicing my invention I take a disk of iron or steel, my other hard tenacious non-hygroscopic material, and apply to such disk a layer or coating of plastic material which is sufficiently thick to receive the sound record, and while such material is in a plastic state press the sound record upon it by a suitable matrix. It is important that the base shall be constructed of a material which is hard and tenacious, so that it is not liable to be broken, either in transportation or use. It is also important that such base shall not be affected by the moisture in the atmosphere, as otherwise it will be liable to warp and thus render the record useless. It is also important that such base be limited in weight. Any material which conforms to these requirements may be used but I prefer sheet

iron or steel of sufficient thickness to retain its flat or other proper form under the conditions of use.

The plastic material (by which term I mean any suitable material which is capable of being rendered plastic to receive the impression of the sound matrix, and which afterward hardens) may be of any of the compositions usually employed for this purpose. I prefer a mixture of barites 33 parts, terra alba 16½ parts, clay 16½ parts, flock 3 parts and shellac 31 parts.

In practicing the process in its preferred form, I first cut the sheet iron or steel into disks of suitable proportions, and thoroughly clean same, whereupon I apply to one side of the disk a layer of paper, asbestos or other suitable fibrous material, preferably by pasting or cementing the paper to the plate, using for this purpose any suitable adhesive, such as an ordinary casein solution. By this means any contraction or expansion of the plate has no substantial effect upon the plastic composition, and the latter is enabled to adhere more effectually than if it were applied directly to the metal itself. I may then apply the plastic composition to the disk in any suitable way as by heating the composition and applying it in its plastic form, but I prefer to coat the disk by two separate operations, by means of which I am enabled to more quickly and conveniently obtain the requisite thickness of coating. To this end I prepare a solution containing a suitable quantity of plastic composition, dissolved in a suitable medium which is adapted to dry quickly, such as alcohol. I preferably use for this 100 parts of plastic composition and 62 parts of alcohol, the shellac of the composition being first dissolved in the alcohol and the whole being intimately mixed, preferably by being ground together. This solution is applied to the paper, and is allowed to dry thereon, this being quickly accomplished by the evaporation of the alcohol. The disks are then taken to the molding room and a further quantity of plastic composition in a dry, powdered or granulated state is applied thereto, preferably by sprinkling it thereon by a sieve or other suitable device. The disks are then placed upon a steam table and the first coating and the powdered composition are softened so that they become substantially homogeneous, and the operator then places the disk in the mold

with its coated side downward and then places the mold in the press. During the pressing operation the mold is cooled so that the composition hardens after receiving the impression of the sound matrix. After the pressing operation the mold is kept closed until the record is cool. If desired instead of sprinkling the composition upon the disk before the latter is heated preliminary to the molding operation, it may be sprinkled thereon after heating, when the first coating is in a softened state, sufficient heat being afterward applied to soften the entire composition.

In the drawings, Figure 1 is an elevation of a disk made according to my invention in its preferred form, Fig. 2 is a section thereof prior to the molding operation, the several layers being exaggerated for clearness, and Fig. 3 is a similar view after the molding operation.

In the drawings A is the base, B is the layer or coating of fibrous material, and C is the layer or coating of plastic material. In Fig. 2 C' is the coating of liquid composition and C² the layer of powdered composition.

The process provided by my invention has several extremely important advantages over those of the prior art. By forming the base of a hard tenacious material of the suitable character, I am enabled to restrict the quantity of plastic material necessarily used to the minimum. This renders it feasible to use the plastic material in the form either of a powder or a liquid solution. Such solution or powder can be easily applied by unskilled labor. I am also enabled to effect an important economy of time during the molding operation. By my invention it is only necessary for the operator to have a number of disks upon the steam table kept at a suitable degree of heat, and to place them in the mold as rapidly as the action of the press permits. This may be easily and rapidly done by unskilled labor, whereas under the methods now commonly practiced it takes considerable time to cut the necessary material for each mold from the sheet and a considerable amount of skill to measure the precise quantity of material which is required for each mold. Each of the disks prepared according to the pres-

ent process contains substantially the correct thickness of plastic material and the operator has nothing further to do than to place them within the molds with the layer of plastic material downward, close the mold and at once place it in the press. Furthermore there is no danger of breaking or cracking the record either during the molding operation or in removing the record from the mold. By my invention I am also enabled to provide a disk having a sound record on each side, which may be easily accomplished by coating the disk on both sides with the plastic composition and impressing the sound records thereon by the use of two matrices in a single molding operation. This is a difficult if not impossible operation with prior processes of manufacture.

The new record provided by my invention has numerous advantages over those heretofore made, including a greater degree of durability, and economy of manufacture. I do not herein claim such record, as this forms the subject matter of another application filed by me July 14, 1909, Serial No. 326,202.

Although I have described in detail the preferred process of practicing my invention, I do not wish to be limited thereto as various changes may be made therein without departing from the spirit of my invention.

An important feature of my invention is the fact that I am enabled to produce a record with an extremely thin coating of composition, and this aids materially in cheapening the cost of the record.

What I claim is:—

The process of making records for phonographs or the like which consists in applying a layer of fibrous material to a metal base and then forming a layer or coating of plastic composition on said fibrous material and impressing a sound record on said layer while in its plastic state.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

WILLIAM SANDERSON.

Witnesses:

EUGENE V. MYERS,
THEODORE T. SNELL.

1871

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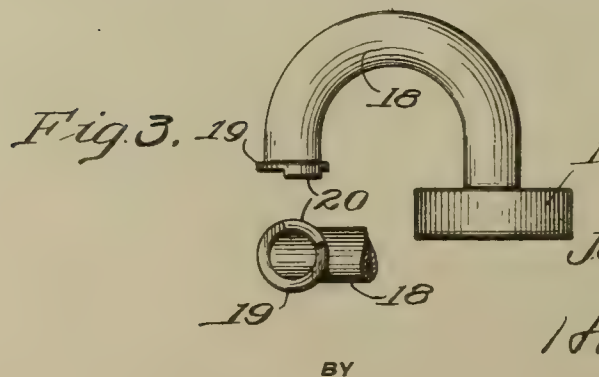
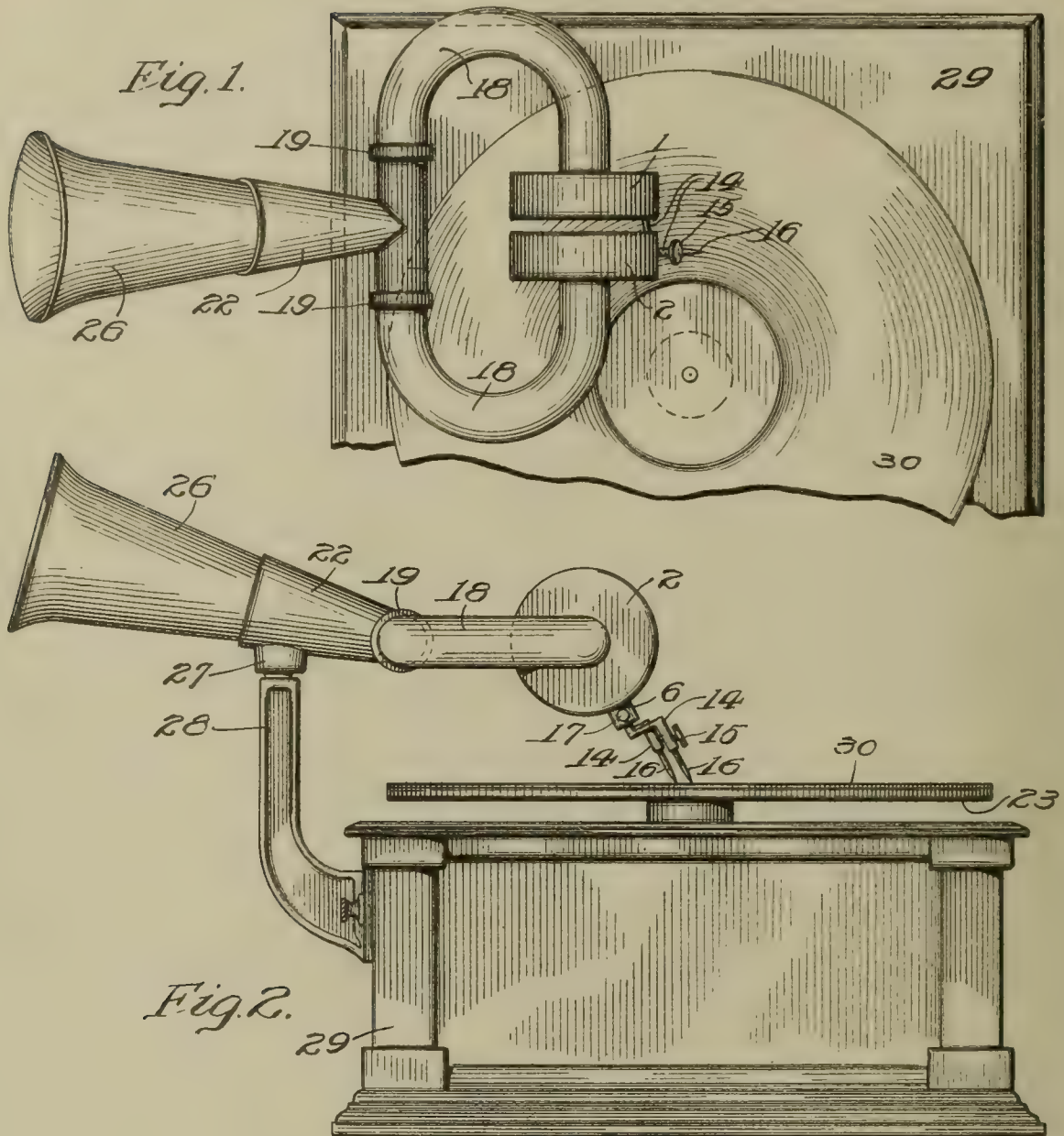
19

J. B. BROWNING.
TALKING MACHINE.
APPLICATION FILED MAR. 31, 1908.

948,040.

Patented Feb. 1, 1910.

2 SHEETS—SHEET 1.



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J. B. BROWNING.
TALKING MACHINE.
APPLICATION FILED MAR. 31, 1908.

948,040.

Patented Feb. 1, 1910.

2 SHEETS—SHEET 2.

Fig. 11.

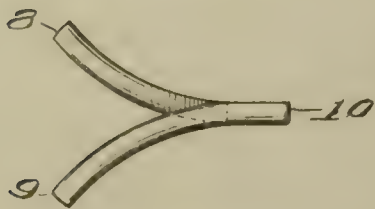


Fig. 4.

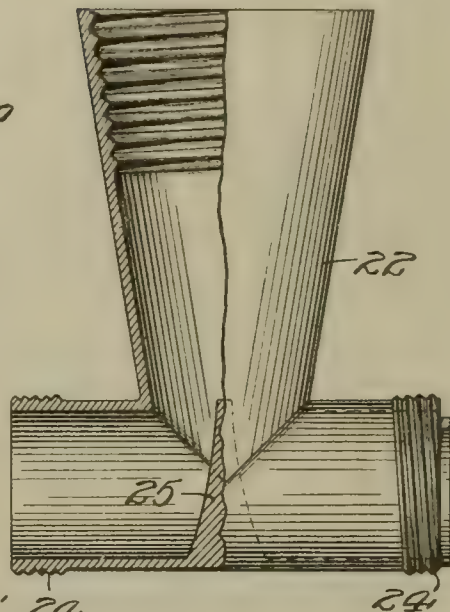


Fig. 6.

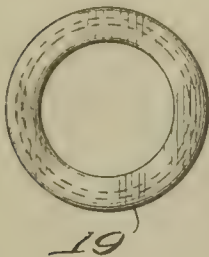


Fig. 7.



Fig. 5.



Fig. 8.

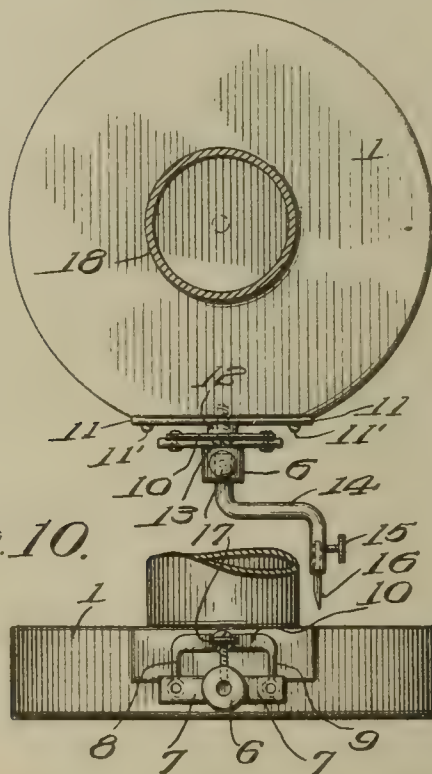
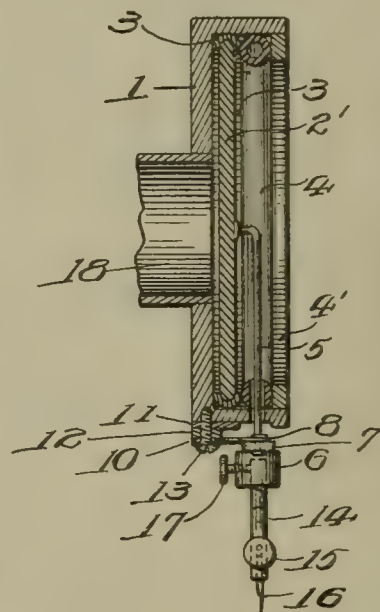


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN B. BROWNING, OF KANSAS CITY, MISSOURI, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, OF CAMDEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

TALKING-MACHINE.

948,040.

Specification of Letters Patent.

Patented Feb. 1, 1910.

Original application filed December 22, 1903, Serial No. 186,197. Divided and this application filed March 31, 1908. Serial No. 424,317.

To all whom it may concern:

Be it known that I, JOHN B. BROWNING, a citizen of the United States, and a resident of Kansas City, county of Jackson, and State of Missouri, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, complete, and exact disclosure, reference being had to the accompanying drawings, forming a part of this specification, this application being a division of my application filed December 22, 1903, Serial No. 186,197.

The objects of my invention are: to provide in a talking machine a plurality of sound boxes arranged to reproduce either simultaneously or separately the same tones from a single record, and to arrange the said boxes so that the operator is enabled to change the volume and quality of the sound at will, by raising one box while the other continues playing; to provide means whereby a pair of independent sound boxes may be supported by a single sound tube; to provide an improved mounting for a diaphragm; to provide an improved mounting for a stylus bar; to provide means for the lateral adjustment of a stylus needle with respect to its stylus bar; and to provide other improvements, all of which will be fully set forth in the following description and particularly pointed out in the appended claims.

Referring to the drawings: Figure 1 is a plan view of a talking machine having my improvements embodied therein. Fig. 2 is a side elevation of the same. Fig. 3 shows an enlarged plan and end view of one of the U-shaped tubes as used in my device. Fig. 4 is a half section and half elevation of the tee connection. Fig. 5 is an end view of one portion of said tee. Figs. 6 and 7 are front and sectional views respectively of one of the couplings. Figs. 8, 9 and 10 are side, central sectional, and bottom views respectively of one of my reproducers, and Fig. 11 is a diagrammatic view of the spring used in my device.

On reference to the drawings it will be observed that my invention embodies two independent sound boxes or reproducers 1 and 2, each having a circular diaphragm 2¹ made of any suitable material, preferably mica, with a split rubber tube or ring 3 incasing the edge of said diaphragm com-

pletely, and preventing the mica from coming in contact with any part of the sound box or casing.

A rubber tube gasket 4 is inserted in the boxes to hold the split tube or ring 3 and mica diaphragm 2¹ in their proper relative positions, and both are kept securely in place by the use of a metallic ring 4¹ which may be connected to or attached to the box or casing in any suitable manner.

The stylus bar 5 is preferably made of one piece of metal, and is phonetically connected to the diaphragm 2¹ by any improved method, and extends through openings in the rubber gasket 4 and sound box casing. The free end of the stylus bar 5 comprises an enlarged cylindrical portion 6 forming a socket, as shown, and is provided with oppositely extending rigid arms 7 rigid therewith, to the ends of which are rigidly secured by rivets or otherwise the ends of the two spring arms 8 and 9, which are connected at their opposite ends by the rigid flat portion 10 forming a U shaped spring support for the stylus bar.

The U shaped support for the stylus bar is preferably made of spring steel. During the course of construction of the same, and before being tempered, the arms 8 and 9 of the support are deflected in opposite directions from the central plane of the support, to assume the position shown in Fig. 11, and the support is then tempered uniformly so that when the support is secured in place between the sound box and the rigid arms of the stylus bar, and the arms 8 and 9 are brought into the same plane and are held in parallel directions, the arms will be under balanced stresses.

In order to connect the U shaped support for the stylus bar rigidly with the sound box casing, and yet to permit free elastic movement of the arms 8 and 9 of the support, one side of the casing is flattened and a plate 11 is rigidly secured thereto by means of screws 11', and the central portion 10 of the U shaped support is held rigidly in position against a washer 12 mounted upon the outer surface of the flat plate 11 by means of a screw 13 passing through the central portion 10, the washer 12, the plate 11, and into the sound box casing. By this means the central portion 10 of the U shaped support is held rigidly, and the arms 8 and 9 of the

support are free to yield to the oscillation of the stylus bar. With this construction in mind it is evident that, owing to the rigidity of the oppositely extending arms 7 of the stylus bar, and the rigidity of the comparatively broad central portion 10 of the U shaped support, the stylus bar is held rigidly by the parallel spaced spring arms 10 against any force tending to oscillate the stylus bar in a plane parallel to the diaphragm, and it is also evident that the comparatively narrow spring arms 8 and 9 of the support will offer very slight resistance to any force tending to oscillate the stylus bar in a plane perpendicular to the diaphragm.

The adjustable needle arm 14 is provided with a set screw 15 to properly hold the needle point 16, when inserted in the hollow end of the adjustable arm 14, and is thus firmly secured to the stylus bar 5 at its free end 6, by the set screw 17. This construction affords an easy and positive method of fixing the distances and maintaining the position of the needles 16, 16 on the sound record 30, as shown in Fig. 2.

It is to be understood that a duplicate of the stylus bar and supporting means therefor described in connection with sound box 1, is mounted upon the sound box 2, and the crank formation of the bar 14 permits the stylus of one sound box to be placed in position to track after the stylus of the other sound box in the same sound groove.

A metallic U shaped tube 18 is permanently secured to the case of the sound box 1 or 2 by a driving fit, as shown in Fig. 9. Said tube has fitted on its free end a collar 19 provided with a stop plate or projection 20 which interlocks with the stop plate 21 on the tapered tee 22. This method of fastening gives the necessary support to the sound boxes 1 and 2 when not resting on the record 30 and still allows for the requisite vertical motion when following the track or grooves of the record, due to the unequal thickness of the record and uneven motion of the turntable 23, which carries the record.

The tapered tee 22 is made of any suitable cast metal and is provided with right and left hand screw threads 24, 24 on each end of the longitudinal run, said threads being so cut as to readily engage the threads 24 of the union collar 19, so as to hold the free end of the tube 18 securely to the tapered tube without binding. The tapered tee is further provided with a circular baffle plate or deflector 25, preferably integral therewith, for the purpose of deflecting the sound waves coming through the tubes 18 from the sound boxes 1 and 2, and giving the waves the proper direction through the tapered tee to the horn or megaphone 26 which is screwed to the tee as shown. The deflector thereby secures the full benefit of the reproducing qualities of each sound box or repro-

ducer through a single channel without any nullifying effect from one reproducer upon the other, greatly increasing the clearness, distinctness and intensity of the reproduced sound waves.

The horn or megaphone 26 and the tapered tee 22 are supported by a post 27 having suitable bearings in the metal arm 28, which is secured to the cabinet 29 in any approved manner. The cabinet 29 contains a spring actuated or other motor necessary to revolve the turntable 23, carrying the record 30. The tee being free to move upon the box and arm connection, thus provides for all necessary lateral motion of the sound boxes or reproducers.

Figs. 1 and 2 of the drawings show the use of the adjustable needle arms 14, 14, applied to bring the needle points 16, 16 into their proper relative positions to reproduce practically simultaneously the same sound waves and thus remedy any imperfection in the tracking of either sound box in the track or groove of the record.

The split rubber tube or ring 3, engaging the diaphragm 2¹ at its edge, serves as a packing and as an insulation for the diaphragm, prevents the edge of the diaphragm from splitting, and reduces to a minimum the rattling and other unpleasant noises caused by the diaphragm coming in contact with the metal parts of the sound box casing.

Although I have shown this invention in only one of the forms in which it may be embodied, yet it is obvious that many changes might be made in the construction of this invention, within the scope of the appended claims, without departing from the spirit of the invention, or sacrificing any of the advantages thereof.

Having thus fully described my invention, what I claim and desire to protect by Letters Patent of the United States is:

1. In a talking machine, a plurality of sound boxes, each of said sound boxes being provided with an independent stylus needle, and means for the lateral adjustment of one of said needles with respect to its box to hold said stylus needles in close proximity to each other whereby said boxes may be used to reproduce simultaneously substantially the same tone from a single record.

2. In a talking machine, a plurality of independently movable sound boxes, each of said sound boxes being provided with an independent stylus needle, and means for the lateral adjustment of one of said needles with respect to its box to hold said stylus needles in close proximity to each other whereby said boxes may be used to reproduce simultaneously substantially the same tone from a single record.

3. The combination with a sound box casing, of a stylus bar, and a mounting for said

bar comprising a U-shaped spring connecting said stylus bar and said casing, the side arms of said spring being yielding and being secured to one of said connected members and the portion of said spring between said arms being rigid and secured to the other of said members.

4. The combination with a sound box casing, of a stylus bar, and a mounting for said bar comprising a U-shaped spring connecting said stylus bar and said casing, said spring having a flattened rigid central portion secured to one of said connected members and having its ends secured to the other of said connected members.

5. The combination with a sound box casing, of a stylus bar having oppositely arranged lateral extensions and a mounting for said bar comprising a U-shaped spring having its ends secured to said extensions and its central portion secured to said casing.

6. The combination with a sound box casing, of a stylus bar having oppositely arranged rigid lateral extensions, and yielding connections between said extensions and said casing.

7. The combination with a sound box casing, of a stylus bar having oppositely arranged rigid lateral extensions, and spring arms connecting said extensions to said casing.

8. The combination with a sound box casing of a stylus bar having oppositely arranged rigid lateral extensions, and a mounting for said bar comprising a U-shaped spring having its ends secured to said extensions and its central portion secured to said casing.

9. The combination with a sound box casing, of a stylus bar, and spaced parallel yielding arms between said casing and said bar supporting said bar.

10. The combination with a sound box casing, of a stylus bar, and spaced parallel yielding arms between said casing and said bar supporting said bar, one end of each arm being secured in a fixed position with respect to said bar.

11. The combination with a sound box casing, of a stylus bar, and spaced parallel yielding arms between said casing and said bar supporting said bar, one end of each arm being held in a fixed position with respect to one of the said connected members.

12. The combination with a stylus bar, of a mounting therefor comprising spaced resilient arms held in substantially the same plane but normally tending to spring upon opposite sides of said plane.

13. The combination with a stylus bar of a mounting therefor comprising a substantially U-shaped spring having its arms held in substantially the same plane but tending to diverge therefrom.

14. The combination with a diaphragm, of a mounting for said diaphragm comprising a ring having a transversely curved convex outer surface, said diaphragm being carried within said ring, and yielding means engaging said ring for holding said ring in position.

15. The combination with a diaphragm, of a mounting for the same comprising a ring having a transversely curved concave inner surface, said diaphragm being carried within said ring, and yielding means engaging said ring for holding said ring in position.

16. The combination with a diaphragm, of a mounting therefor comprising a ring having a transversely curved convex outer surface and a transversely curved concave inner surface, said diaphragm being held within the inner concave surface of said ring, and yielding means engaging said ring for holding said ring in position.

17. The combination with a diaphragm, of a mounting therefor comprising a yielding ring having a transversely curved convex outer surface and a transversely curved concave inner surface, said diaphragm being held within the inner concave surface of said ring, and a yielding ring contacting with said first mentioned ring for holding said first mentioned ring in position.

18. The combination with a diaphragm, of a mounting for said diaphragm comprising a split resilient tubular ring of circular cross section, said diaphragm being held within the inner surface of said ring, and a yielding tubular ring contacting with said first mentioned ring for holding said first mentioned ring in position.

19. The combination with a sound box, of a stylus bar having a rotatable needle arm extending laterally therefrom, and having a needle socket substantially parallel to said bar.

20. The combination with a sound box, of a stylus bar having an adjustable rotatable needle arm extending laterally therefrom, and having a needle socket substantially parallel to said bar.

21. The combination with a sound box, of a stylus bar having an adjustable needle arm extending laterally therefrom, said arm being rotatable with respect to said bar, and being provided with means for holding a needle substantially parallel to said bar.

22. The combination with a sound box, of a stylus bar, and means carried by the bar for the lateral adjustment of a needle with respect to said bar.

23. The combination with a sound box, of a stylus bar, and a needle arm extending laterally therefrom, said rotatably adjustable needle bar being provided with means for holding a needle substantially parallel to the longitudinal axis of said bar.

24. The combination with a sound box, of a stylus bar, and a needle arm extending laterally therefrom, said needle bar being provided with means for holding a needle substantially parallel to the longitudinal axis of said bar, said needle arm being rotatable with respect to said bar, and said bar being provided with means to hold said arm in a fixed position.
25. In a talking machine, the combination with a pair of independently movable sound boxes, of a stylus bar upon each box and a laterally extending needle arm upon each stylus bar.
26. In a talking machine, the combination with a pair of independent sound boxes, of a pair of independent stylus bars each having means for holding a stylus needle, and means whereby said needles may be brought into operative alinement with each other so that said needles may produce simultaneously substantially the same tones from a single record.
27. The combination with a stylus bar, of a mounting therefor, comprising a pair of resilient arms held in substantially the same plane, but normally tending to spring upon opposite sides of said plane.
28. The combination with a stylus bar, of a mounting therefor, comprising resilient arms, said arms being held out of their normal positions by means of opposite stresses respectively.
29. The combination with a stylus bar, of a mounting therefor, comprising a U-shaped spring, the ends of the spring being secured to the bar and the central portion of the spring being secured to a fixed support.
30. The combination with a stylus bar, of a needle arm extending laterally therefrom, and adjustable with respect thereto.
31. The combination with a stylus bar, of means carried thereby for holding a needle, said means being laterally adjustable with respect to said bar.
32. The combination with a stylus bar, of a needle arm extending laterally therefrom, said arm being rotatably adjustable with respect to said bar.
33. In a sound box, the combination with a diaphragm, of a yielding ring for holding said diaphragm in position, and yielding means contacting with said ring for holding said ring in position.
34. The combination with a stylus bar, of a plurality of spaced yielding members forming the sole support for said bar, said yielding members being free to bend, but held against torsion.
35. The combination with a stylus bar, of spaced flat yielding members free to bend, but held against torsion, forming the sole support for said bar.
36. The combination with a stylus bar, of spaced yielding members extending transversely of said bar, and forming the sole support of said bar, being free to bend, but held against torsion.
37. The combination with a stylus bar, of spaced parallel yielding members forming the sole support for said bar.
38. The combination with a stylus bar, of spaced parallel yielding members extending in the same direction from said bar forming the sole support for said bar.
39. The combination with a stylus bar, of spaced flat spring members, free to bend, but held against torsion, forming the sole support for said bar.
40. The combination with a stylus bar, of spaced flat spring members extending transversely of said bar, and forming the sole support thereof, said members being free to bend, but held against torsion.
41. The combination with a stylus bar, provided with rigid lateral extensions, of yielding members connected to said extensions, and forming the sole support of said stylus bar.
42. The combination with a stylus bar, provided with rigid lateral extensions, of yielding members connected to said extensions, and extending transversely of said bar, forming the sole support thereof.
43. In a sound box, the combination with a diaphragm, of a stylus bar phonetically connected thereto, rigid lateral extensions arranged upon opposite sides of said bar, and spaced yielding supports for said bar, secured to said extensions, and extending in a direction substantially perpendicular to said diaphragm.
44. In a sound box, the combination with a diaphragm, of a stylus bar phonetically connected thereto, rigid lateral extensions arranged upon opposite sides of said bar, and spaced yielding supports for said bar, secured to said extensions and extending in a direction substantially perpendicular to said diaphragm, and projecting in the same direction from said bar.
45. In a sound box, the combination with a fixed member, of a diaphragm, a stylus bar spaced from said fixed member and phonetically connected to said diaphragm, and spaced yielding members extending transversely of said bar, and toward the plane of said diaphragm connecting said fixed member and said bar.
46. In a sound box, the combination with a casing, of a diaphragm, a stylus bar spaced from said casing and phonetically connected to said diaphragm and spaced yielding members connecting said casing and said bar, and held against torsion.
47. In a sound box, the combination with a diaphragm, of a stylus bar phonetically connected thereto and spaced yielding mem-

bers forming the support for said bar, the axis of oscillation of said bar being substantially in the plane of the diaphragm.

48. In a sound box, the combination with
5 a diaphragm having a transversely rounded peripheral edge, of a yielding mounting engaging the periphery of said diaphragm.

49. In a sound box, the combination with
10 a diaphragm having a transversely rounded peripheral edge, of a yielding mounting engaging the periphery of said diaphragm and frictionally retained thereon.

50. In a sound box, the combination with
15 a casing, of a diaphragm, a yielding ring between the diaphragm and the casing, and yielding means engaging said ring to hold the same in position.

51. In a sound box, the combination with
20 a diaphragm, of a mounting therefor comprising a ring engaging the periphery of the diaphragm, and a yielding tubular ring engaging said first mentioned ring for holding the same in position.

52. In a sound box, the combination with
25 a casing, of a diaphragm having a transversely rounded edge, and a yielding ring between the periphery of the diaphragm and the inner surface of the casing, said ring being held against movement in the
30 plane of the diaphragm by said casing.

53. In a sound box, the combination with
a casing, of a diaphragm, and a yielding ring between the periphery of the diaphragm and the inner surface of the casing, said
35 ring being held against movement in the plane of the diaphragm by said casing, and yielding means contacting with said ring to hold said ring against movement in a direction transverse to the plane of the
40 diaphragm.

54. In a sound box, the combination with
a diaphragm, of a mounting therefor comprising a split tubular yielding ring incasing the edge of said diaphragm, said ring
45 having a transversely rounded outer surface.

55. In a sound box, the combination with
a diaphragm having a rounded peripheral edge, of a split tubular yielding ring having a transversely rounded inner surface incasing said edge for supporting said diaphragm.
50

56. In a sound box, the combination with
a casing, having a cylindrical bore, of a diaphragm, and a yielding ring engaging the edge of said diaphragm and having a
55 transversely rounded outer surface engaging the cylindrical surface of said bore.

57. The combination with a stylus bar, of a mounting therefor comprising a resilient arm held normally in flexed condition.

60 58. The combination with a stylus bar, of a mounting therefor comprising a pair of resilient arms flexed in opposite directions.

59. The combination with a stylus bar, of a mounting therefor comprising a pair of

resilient arms normally tending to flex in 65 opposite directions.

60. The combination with a stylus bar, of a mounting therefor, comprising a pair of resilient arms extending in the same direction from said bar and normally tending to 70 flex in opposite directions.

61. The combination with a sound box, of means for holding a stylus needle and means for effecting a lateral adjustment of the needle with respect to the box. 75

62. In a sound box, the combination with a diaphragm having a transversely rounded peripheral edge, of a yielding mounting engaging the periphery only of said diaphragm. 80

63. In a sound box the combination with a casing having a cylindrical inner surface, of a diaphragm having a transversely rounded peripheral edge, and a yielding annular mounting engaging the periphery only of 85 said diaphragm, said mounting having a transversely convex outer surface contacting with the cylindrical inner surface of the sound box.

64. In a sound box the combination with 90 a diaphragm, of a yielding mounting engaging the peripheral edge only of said diaphragm, said mounting having a transversely convex outer surface.

65. In a sound box the combination with 95 a casing having a cylindrical inner surface, of a diaphragm and a yielding mounting engaging the peripheral edge only of said diaphragm, said mounting having a transversely convex outer surface bearing against 100 the cylindrical inner surface of the casing.

66. In a sound box, the combination with a diaphragm, of a stylus bar, rigid lateral extensions arranged upon opposite sides of said bar and rigid therewith, and yielding 105 supports for said bar secured transversely of said bar to said extensions and projecting in the same direction therefrom.

67. In a sound box, the combination with a diaphragm, of a stylus bar, rigid lateral 110 extensions arranged upon opposite sides of said bar and rigid therewith, and flat spring supports for said bar secured transversely of said bar to said extensions and projecting in the same direction therefrom. 115

68. In a sound box, a diaphragm, a stylus bar having one end thereof in acoustic contact with said diaphragm and spaced springs projecting in the same direction substantially perpendicular to the diaphragm upon 120 which said stylus bar is supported upon the sound box casing, said stylus bar being located substantially midway between said springs, in a plane at right angles to the plane of the said springs, said springs being 125 free to bend but held against torsion.

69. In a sound box, a diaphragm, a stylus bar having one end thereof in acoustic con-

tact with said diaphragm, and spaced springs located on opposite sides of said stylus bar projecting in the same direction, upon which said stylus bar is supported upon the sound
5 box casing, the said stylus bar being located in a plane at right angles to the plane of the said springs, said springs being free to bend but held against torsion.

70. In a sound box, the combination with
10 a diaphragm, of a stylus bar phonetically connected thereto and provided with rigid lateral extensions, and spaced flat springs oblong in transverse section connected to said extensions and forming the sole support
15 for said stylus bar.

71. In a sound box, the combination with a diaphragm, of a stylus bar phonetically secured thereto, and spaced spring members oblong in cross section and holding each
20 other against torsion forming the sole support for said bar.

72. In a sound box, the combination with a fixed member, of a diaphragm, a stylus bar spaced from said fixed member and phonetically connected to said diaphragm, and
25 spaced yielding members extending transversely of said bar and toward the plane of said diaphragm connecting said fixed member and said bar.

30 73. In a sound box, a stylus bar, and

spaced spring members extending transversely of said bar and forming the sole support therefor, said spaced members being free to bend but being held against torsion.

74. In a sound box, a stylus bar, and
35 spaced resilient members extending transversely of said bar and forming the sole support therefor, said spaced members being free to bend but being held against torsion.

75. In a sound box, the combination with
40 a diaphragm, of a stylus bar having a stylus socket, rigid lateral extensions arranged upon opposite sides of said bar and rigid therewith, and yielding supports for said bar secured transversely of said bar to said ex-
45 tensions and projecting in the same direction therefrom, the longitudinal axis of said socket being in a plane perpendicular to the axis of oscillation of said bar.

76. The combination with a stylus bar pro-
50 vided with rigid lateral extensions, of yielding members connected to and extending transversely of said extensions, and forming the sole support of said stylus bar.

In witness whereof, I hereunto set my
55 hand this 18th day of March, 1908.

JOHN B. BROWNING.

Witnesses:

BURTON J. PIERCE,
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D. H. HAYWOOD.
RECORD FOR SOUND REPRODUCING MACHINES.
APPLICATION FILED AUG. 23, 1909.

Patented Feb. 1, 1910.

2 SHEETS—SHEET 1.

948,137.

Fig. 1.

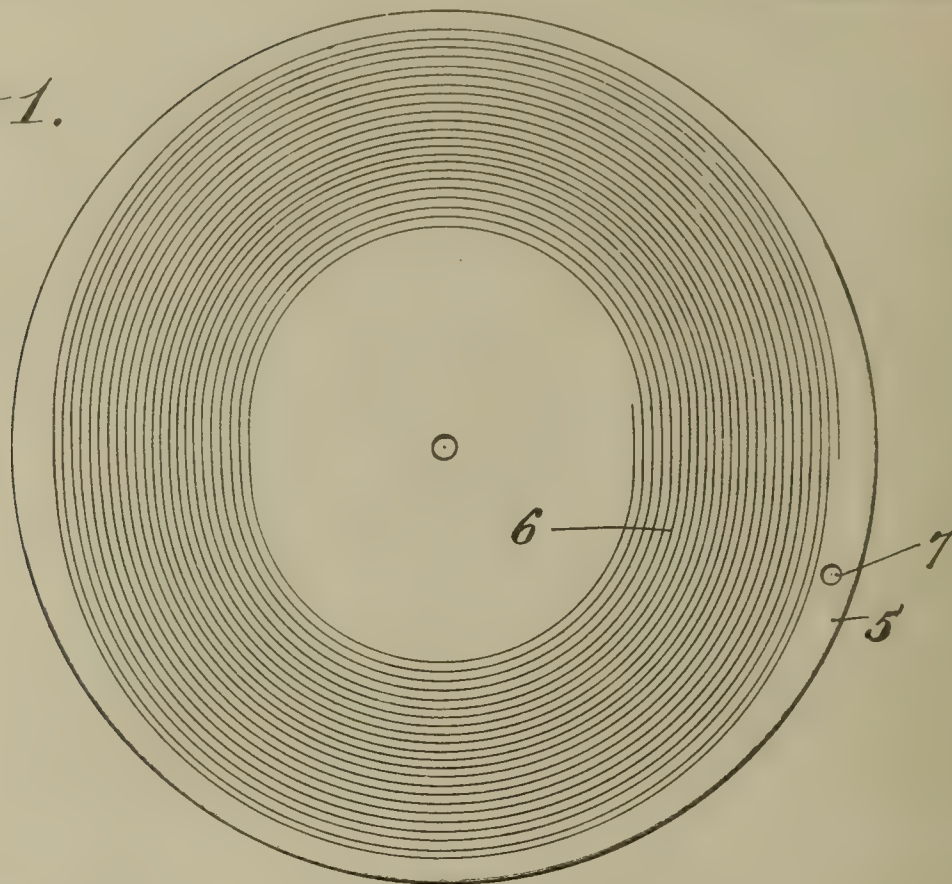
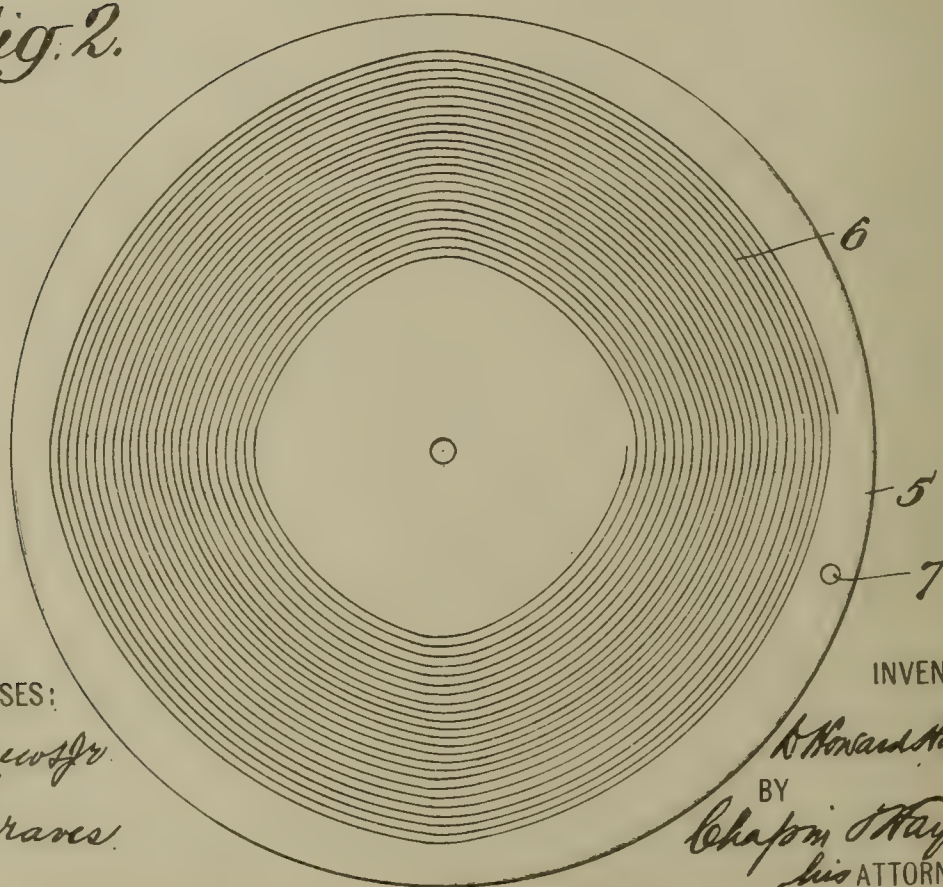


Fig. 2.



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RECORD FOR SOUND REPRODUCING MACHINES.
APPLICATION FILED AUG. 23, 1909.

948,137.

Patented Feb. 1, 1910.

2 SHEETS—SHEET 2.

Fig. 3.

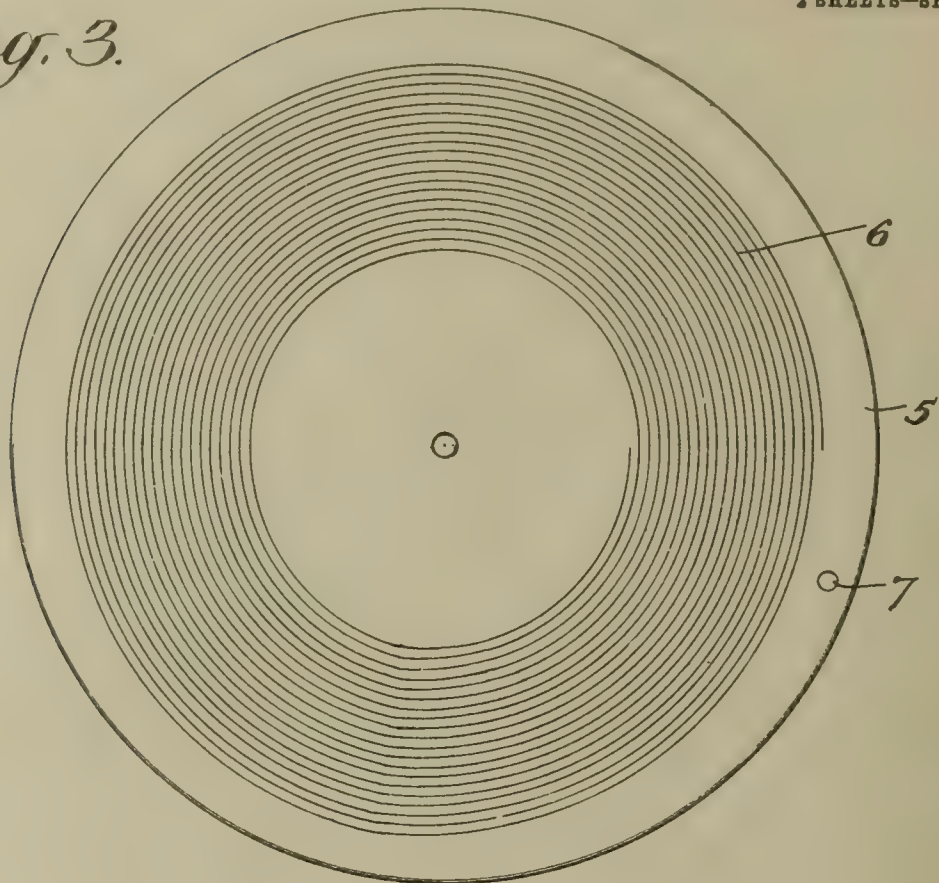
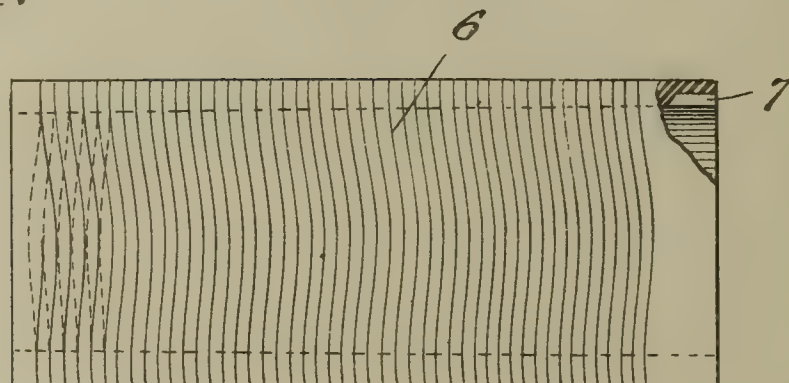


Fig. 4.



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UNITED STATES PATENT OFFICE.

DANIEL HOWARD HAYWOOD, OF NEW YORK, N. Y.

RECORD FOR SOUND-REPRODUCING MACHINES.

948,137.

Specification of Letters Patent.

Patented Feb. 1, 1910.

Application filed August 23, 1909. Serial No. 514,091.

To all whom it may concern:

Be it known that I, DANIEL HOWARD HAYWOOD, a citizen of the United States of America, and a resident of New York, county of New York, and State of New York, have
5 invented certain new and useful Improvements in Records for Sound-Reproducing Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.
10

The sound grooves of sound reproducing machine records commonly advance, independently of their sound producing undulations, in the form of a regular spiral or helix,
15 so that the stylus employed in connection therewith has a regular and uniform transverse feeding movement as the record rotates.

The object of my present invention is to
20 provide for an irregular transverse feeding movement of the stylus, and to this end I construct the record with a sound groove which, independently of its sound producing undulations, advances irregularly. The preferred form of feeding movement I desire
25 to impart to the stylus is a to and fro movement, (the total movements in one direction being, of course, in excess of the total movements in the other, whereby the stylus is gradually, though irregularly, advanced)
30 and to effect this I provide the record with a sound groove which advances and recedes as the record rotates. I also preferably provide the record with a positioning recess so
35 that the record may be properly positioned upon its support in the machine with respect to the feeding mechanism. Included among the advantages of this form of feed are, first, that the stylus carrying arm has thereby a
40 free swinging movement; second, the normal pressure upon the sound box diaphragm is thereby more uniformly distributed, *i. e.* such pressure is applied first upon one side of the diaphragm, and then upon the other;
45 third, there is a greater tendency toward centralizing the stylus in the sound groove; and fourth, the records so constructed are adapted only for use in the specific form of machine for which they are designed, or which is
50 designed to receive them. This latter is a feature of great commercial importance in that it tends to largely reduce the unauthorized copying of records, and the unauthorized use of records in machines for which
55 they were not intended.

In order that my invention may be fully understood, I have illustrated several forms of records, constituting embodiments thereof, in the accompanying drawings which I will now proceed to explain, and will thereafter
60 point out the novel features in claims.

In the drawings: Figure 1 is a face view of a record of the flat disk type, constructed according to my invention. Figs. 2 and 3
65 are similar views, illustrating different forms of the sound groove. Fig. 4 is a view in side elevation of a record of the cylinder type, constructed in accordance with my invention.

In Fig. 1, the record comprises a flat disk
70 of any suitable material in the face of which appears the sound groove 6. The sound groove, so far as its sound producing undulations are concerned, may be of any desired character, the preferable form in this
75 type of record being that in which the depth of the groove is uniform, and the undulations are lateral. The undulations are not illustrated herein, however, first because they are exceedingly minute at best and
80 hence difficult to show, and second because an attempt to show them might readily obscure the illustration of the general direction of the groove which it is most desired to
85 make clear. The general direction of this groove will be seen to be coincident with a curved line generated by the to and fro
90 movement of a point in a line radial of the disk which rotates in one direction in the plane of the face of the disk about the axis thereof. If such an expression be permissible this curved line might be termed an oblong spiral. The groove may readily be
95 formed by giving the cutting stylus in forming the record, a lateral to and fro movement as a part of the general lateral feeding movement thereof as the record rotates, or
100 imparting a constant to and fro movement to the stylus and a feeding movement to the disk as well as a movement of rotation to the disk, or a uniform lateral feeding movement to the stylus and a constant to and fro lateral movement to the disk while simultaneously rotating it.

One form of machine for producing a
105 record of the character disclosed herein is shown in a copending application Serial No. 534,834, filed December 24th, 1909.

It will of course be understood that the form of the groove, considered in relation to
110

its direction, is in no way limited to that shown in Fig. 1, as it is obvious from what has been set forth above that many varieties may be employed. In Fig. 2 I have shown
5 a form in which there are twice as many to and fro movements in the general direction of the groove as there are in the form shown in Fig. 1, and the changes are more abrupt at some points than at others, while in Fig.
10 3, the groove lies in a series of concentric semicircles upon one side of a diametric line through the disk, while upon the other side of such line it advances and recedes in the manner illustrated in Fig. 1 and described
15 in connection therewith.

In Fig. 4 in which the cylinder form of record is illustrated, I have shown a groove which advances and recedes with respect to a transverse line (parallel with the axis of
20 rotation of the record) as the record revolves, the groove, however, having made a total advance at each revolution of the record. The general direction of this groove is similar to that shown in Fig. 1, but adapted
25 to the cylinder form of record.

In order that the record may be properly positioned upon its carrier in the sound reproducing machine, I preferably provide the same with an eccentrically disposed positioning recess, such recess being shown at
30 7 in Figs. 1, 2, 3, and 4. This compels the proper angular relationship between the record and the feed mechanism, and is im-

portant where a positive feed is employed in the reproducing machine.

35

What I claim is:

1. A record element for sound reproducing machines, having in the face thereof a sound groove which in its general direction advances and recedes transversely as the element is revolved.

40

2. A record element for sound reproducing machines, having in the face thereof a continuous sound groove which, independently of its sound producing undulations,
45 advances irregularly throughout its length.

3. A record disk having in the face thereof a sound groove the direction of which, independently of its sound producing undulations, follows a path produced by a point
50 which advances and recedes along a line, radial with respect to the disk, to which a movement of revolution in one direction is given about the axis of the disk in the plane of the face thereof.

55

4. A record element for sound reproducing machines, having in the face thereof a sound groove which in its general direction advances and recedes transversely as the element is revolved, the said element having
60 therein an eccentrically disposed positioning recess.

D. HOWARD HAYWOOD.

Witnesses:

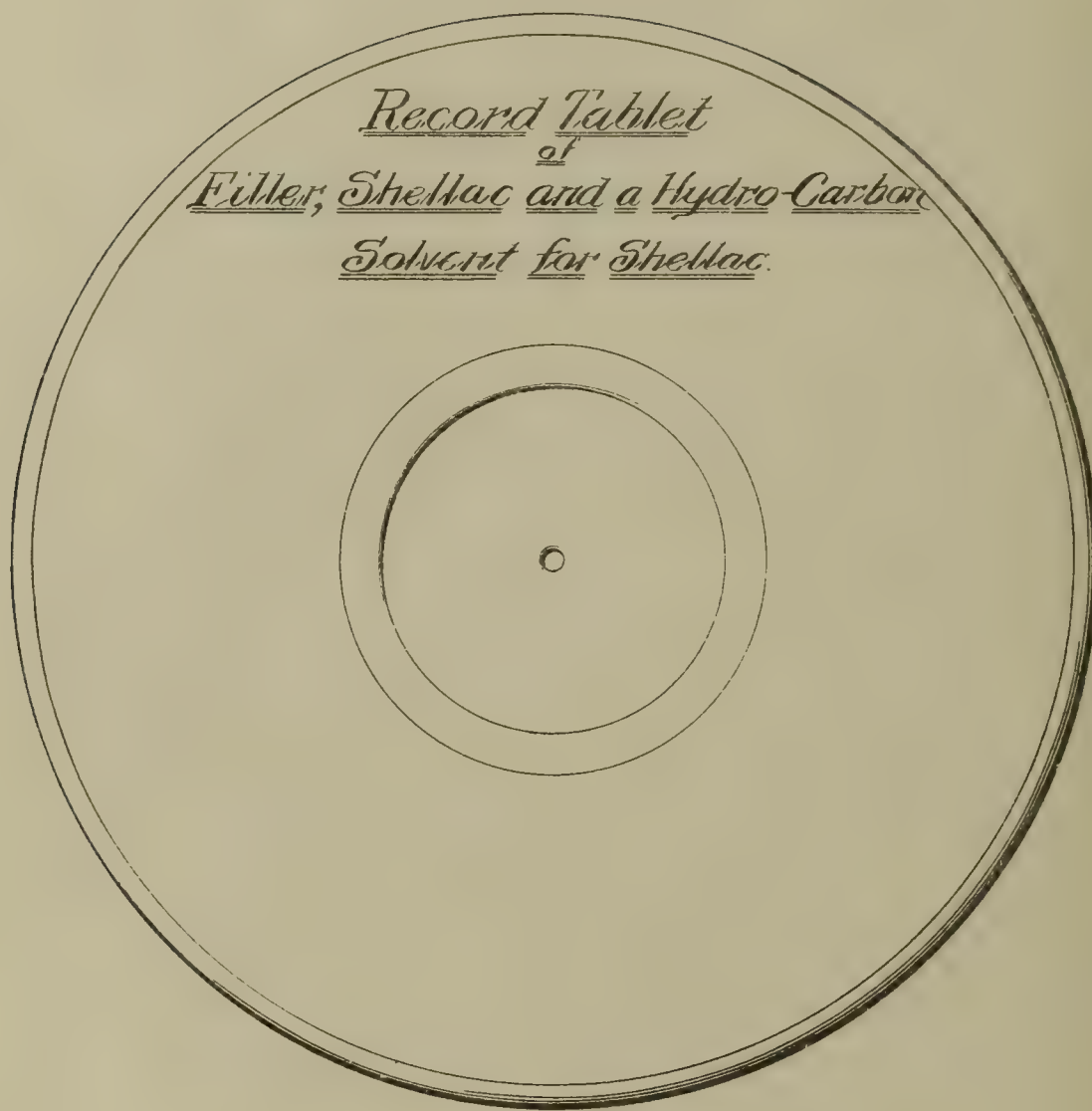
LYMAN S. ANDREWS, Jr.,

F. B. GRAVES.

J. C. ENGLISH.
COMPOSITION FOR SOUND RECORDS AND OTHER OBJECTS.
APPLICATION FILED MAR. 24, 1906.

948,314.

Patented Feb. 8, 1910.



WITNESSES
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A. G. Gardner.

BY

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John C. English
James P. Ellis.
ATTORNEY

UNITED STATES PATENT OFFICE.

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COMPOSITION FOR SOUND-RECORDS AND OTHER OBJECTS.

948,314.

Specification of Letters Patent.

Patented Feb. 8, 1910.

Application filed March 24, 1905. Serial No. 251,874.

To all whom it may concern:

Be it known that I, JOHN C. ENGLISH, a citizen of the United States, and a resident of Camden, State of New Jersey, have invented certain new and useful Improvements in Compositions for Sound-Records and other Objects.

In the manufacture of sound records, the requirements of the compounds which form the body of the records and the reproducing surface thereof, involve many conditions affecting the action of the reproducing needle upon the record in the reproduction of sounds. Among these requirements are toughness, or freedom from cracking and warping, durability, or a resistance to the action of the needle, which has a tendency to wear the surface or grooves of the record as the same passes through said grooves, fineness of texture of the material, which, if coarse or gritty, has a tendency to grind or abrade the needle to an undue extent, and constancy in a degree of hardness under all conditions of temperature and moisture to which a commercial record would ordinarily be subjected. Ordinarily, in the manufacture of sound records made of compositions of shellac, a body pigment or filler, the use of gum shellac gives a toughness which has, up to the time of this invention, not been capable of being supplied by any other material or gum. The toughness of varnishes, when mixed with body materials or fillers, is due to the oils which the varnish contains, and owing to the presence of these oils the record is much less durable, requires much greater time in manufacture, and is liable to become distorted and warped, owing to the greater viscosity of the varnish.

Heretofore it has been found that mixtures for record material containing body material, such as clay, metallic oxids, and similar powders and pigments, require a comparatively large quantity or percentage of shellac, which, in order to produce the best results, is usually about forty per cent., by weight, of the total amount of the mixture. The reduction of this amount of shellac in these mixtures renders the record more brittle and liable to crack, while at the same time the abrasive effect upon the needle is greatly increased.

The object, therefore, of my invention is to produce such a composition or mixture

for use in sound records, and other objects, which will not only have all the advantages of the mixtures of shellac and the different body materials, which have heretofore been used, but will also have distinct advantages over the same.

Gum shellac, when in its purest form and highest grade, resembles well seasoned glue in consistency and color, and it is the aim of manufacturers of record to obtain shellac as near to this standard as possible. Of course shellac, when received by the users in the regular course of trade, varies considerably in the texture and quality, and it has been my aim to provide an ingredient or substance which will not only improve the texture and quality, but will reduce the shellac to a uniform grade. I have found that by adding certain hydrocarbons to gum shellac, that this result is produced in an extremely economical and satisfactory manner. Furthermore, different earthy materials, such as fossil flour, clays, powdered silica, metallic oxids, and other cheap earthy material and pigments, require greatly varying amounts of shellac to produce the requisite adhesive purpose and toughness to the composition. In the use of my improved composition, the embodiment of these materials provides a much more uniform quantity of the binder heretofore attained by gum shellac.

The object, therefore, of my invention is to generally improve the material from which sound records and other objects requiring material having the same characteristics are made.

In the drawing forming a part of this specification is illustrated a sound record tablet of the disk type with the names of the ingredients inscribed thereon, although it is obvious that my invention is not limited to any particular shape or type of tablet.

Briefly, my invention comprises the use of certain hydrocarbons, such as nitro-naphthol, beta-naphthol, nitro-benzol, which I have found readily unite with shellac and form a solvent therefor by the aid of the application of heat.

One form of the composition which I have found to be especially satisfactory is a mixture of about ten per cent. of nitro-naphthol to ninety per cent. of shellac. This mixture, when combined with the body material or filler, is used in the ratio of about twenty

per cent. of said mixture to eighty per cent. of said body material or filler. It will thus be seen that it is necessary to use only about eighteen parts in a hundred of shellac in the resultant composition, instead of forty parts in a hundred, which has heretofore been necessary. It will thus be seen that the amount of shellac, which is the most expensive part of the record material, is greatly reduced, and owing to this reduction in the amount of shellac the slight variation in the amount required for different body materials, or fillers, will not be so noticeable.

Of course it is obvious that I am not limited to the use of nitro-naphthol in combination with shellac or similar gums, but I may use other hydrocarbon derivatives of the same series, or even of other series where the results produced are the same as with those substances already named.

I am aware that shellac is claimed to be soluble in benzoin, and after first having been treated with borax, but the composition which I have invented is entirely distinct from this, as I combine the hydrocarbon which I use directly with the shellac without any intermediate substance which will produce the soluble qualities.

One of the particular advantages of my improved composition resides in the fact that the addition of nitro-naphthol and similar hydrocarbons, renders the shellac considerably more fluid under the influence of heat, and, therefore, not only allows the body or filler material to be more intimately mixed therewith, but also allows a much sharper and accurate record to be produced by the pressure of the matrix upon the surface of the blank from which the record is molded or stamped. Owing also to this greater fluidity, a considerable saving of time is effected in stamping the records, as it requires a shorter time for the material of the record blank to completely enter all the recesses and minute parts of the groove.

As above referred to, further advantages of my improved composition reside in the fact that the record material is made much tougher and more lasting, the characteristic of brittleness being considerably reduced by the addition of nitro-naphthol, and similar hydrocarbons. I have found that the addition of nitro-naphthol renders shellac of a more flexible and what might be called a leathery consistency, without in any way affecting the solidity or elasticity of the substance, for it is well known in the manufacture of talking machine records, that the

greater body of the material used and the elasticity of the substance employed, the more efficient will be the effect upon the stylus or needles of the reproducing mechanism. This, therefore, is an additional advantage of my improved compound, inasmuch as the solidity and elasticity is in no way reduced, and is in fact made slightly greater, although the record is made less brittle than heretofore.

Having thus described my invention, I do not wish to be understood as being limited to the precise ingredients of my improved compound herein set forth, but the same may be varied according to choice and special requirements, without departing from the spirit and scope of my invention, but

What I claim and desire to protect by Letters Patent, is,—

1. In a composition for molded objects, the combination with a suitable body material or filler, of shellac and a hydrocarbon in which said shellac is soluble.

2. In a composition for molded objects, the combination with a suitable body material or filler, of shellac and a hydrocarbon of the naphthalene series in which said shellac is soluble.

3. In a composition for molded objects, the combination with a suitable body material or filler, of shellac and a crystalline hydrocarbon of the naphthalene series.

4. In a composition for molded objects, the combination with a suitable body material or filler, of shellac and nitro-naphthol.

5. In a composition of molded objects the combination with a suitable filler, of shellac and a nitro-hydro carbon.

6. In a composition of molded objects the combination with a suitable filler, of shellac and a crystalline nitro-hydro carbon of the naphthalene series.

7. In a composition for records for talking machines, the combination with a suitable filler, of shellac and a hydrocarbon of the naphthalene series.

8. In a composition for records for talking machines, the combination of a suitable non-wax-like filler or body material, and a hydrocarbon of the naphthalene series.

9. In a composition for records for talking machines, the combination of a suitable filler or body material, and naphthalene.

In witness whereof, I have hereunto set my hand this 23rd day of March, 1905.

JOHN C. ENGLISH.

Witnesses:

ALEXANDER PARK.

EDW. W. VAILL, Jr.

W. H. HOSCHKE.

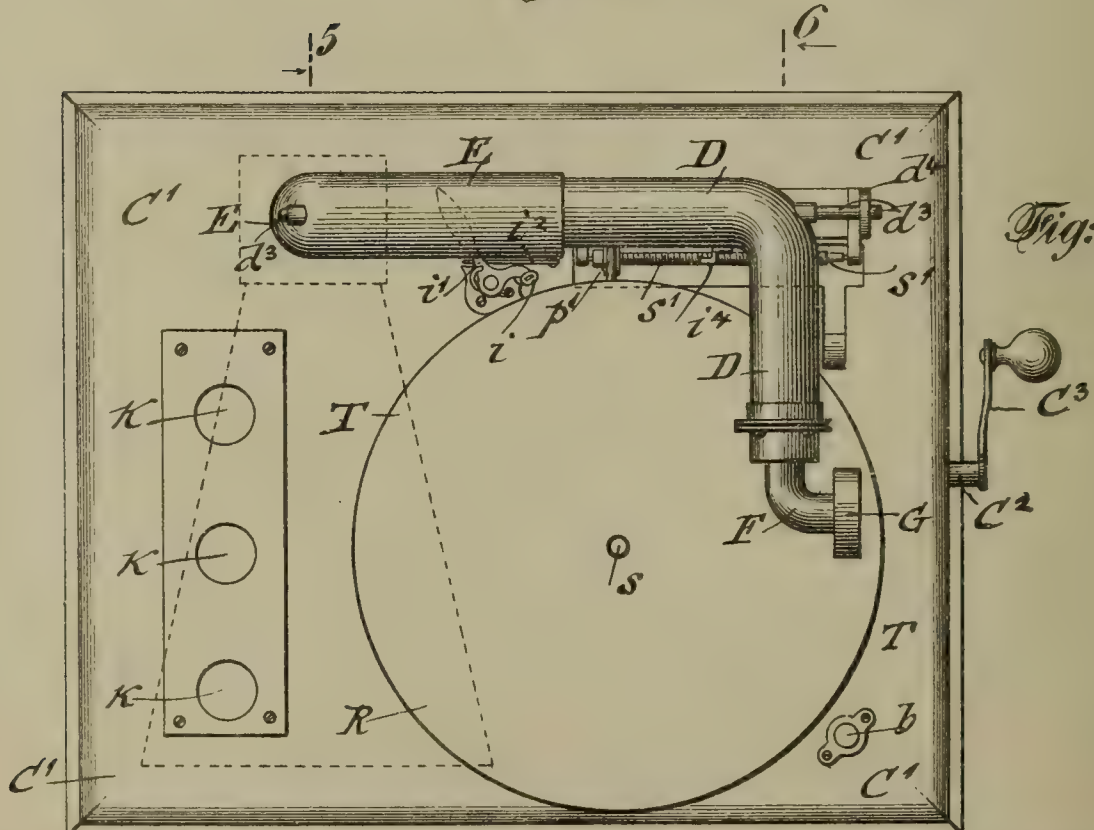
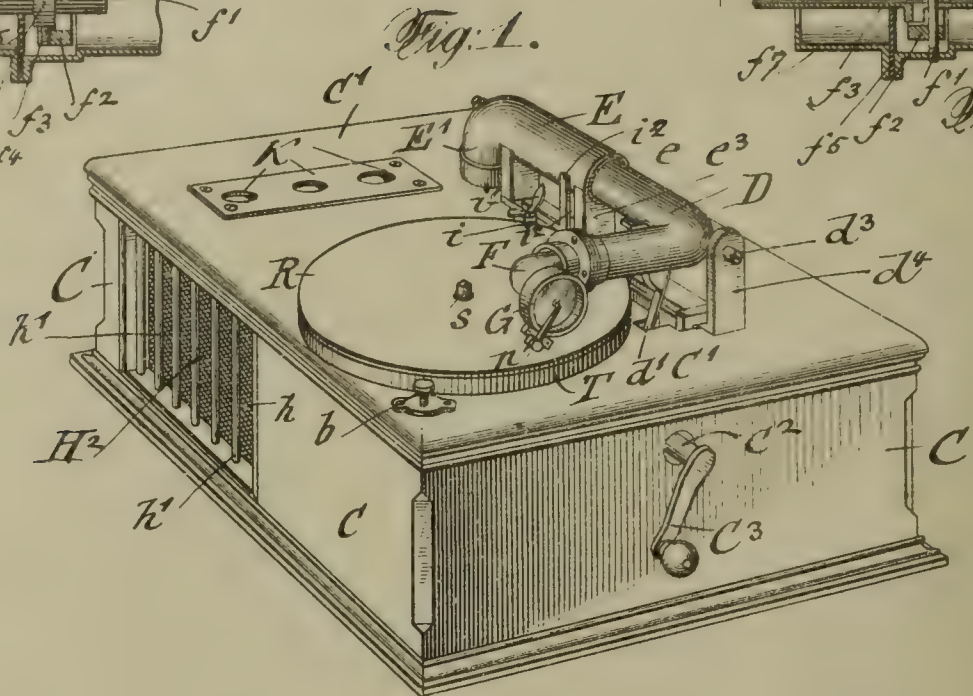
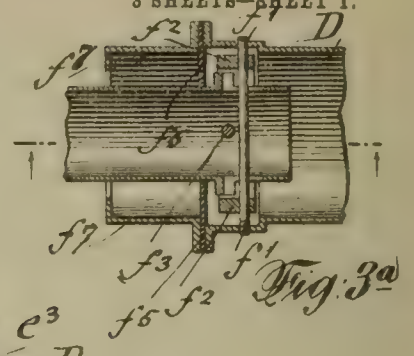
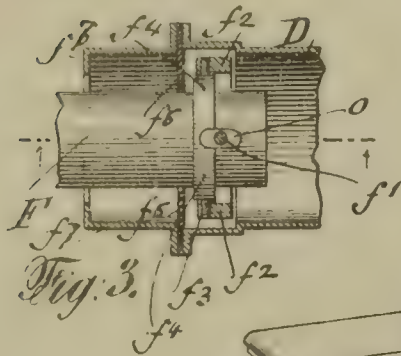
PHONOGRAPH.

APPLICATION FILED MAR 26, 1909.

948,327.

Patented Feb. 8, 1910.

3 SHEETS—SHEET 1.



Witnesses:
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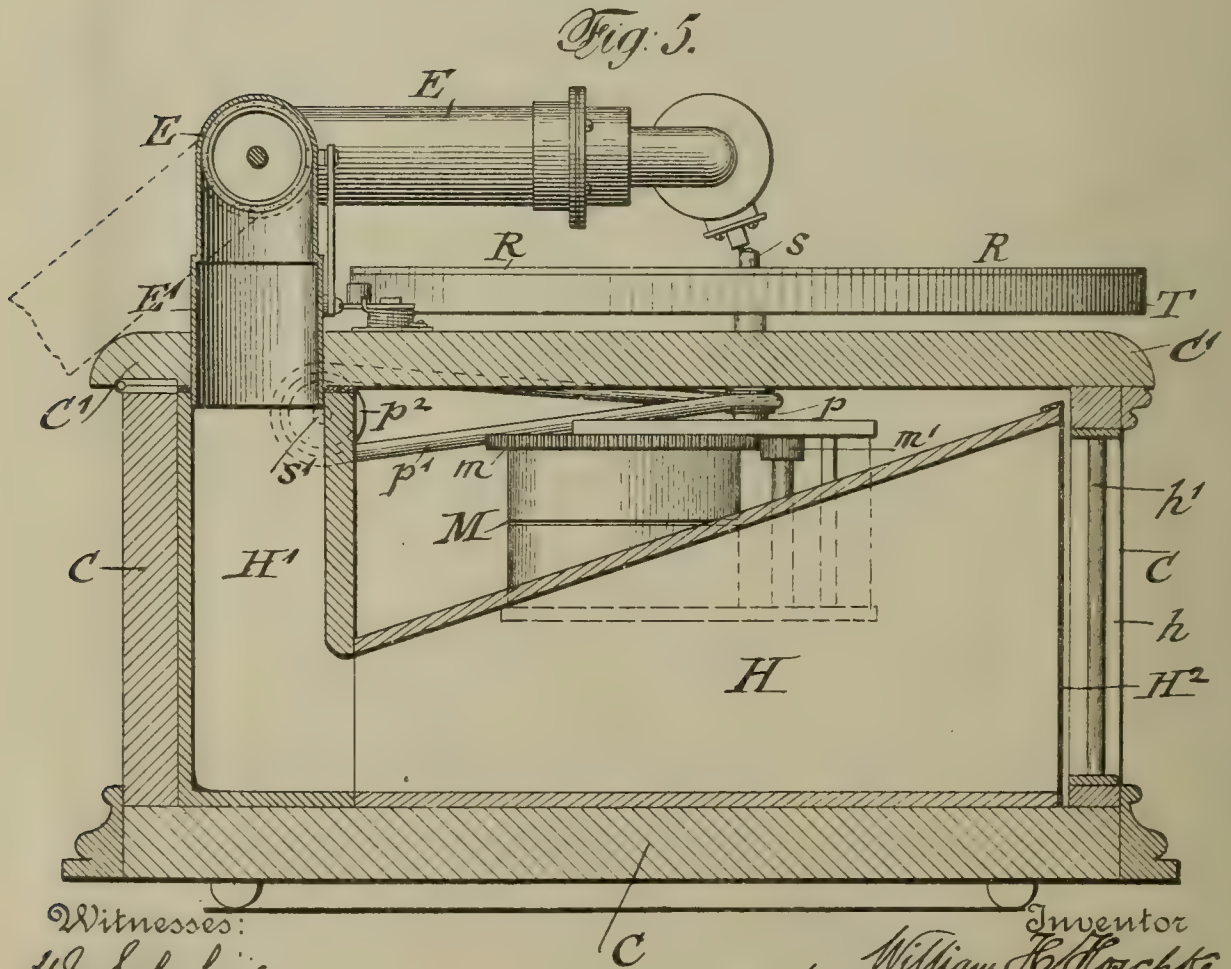
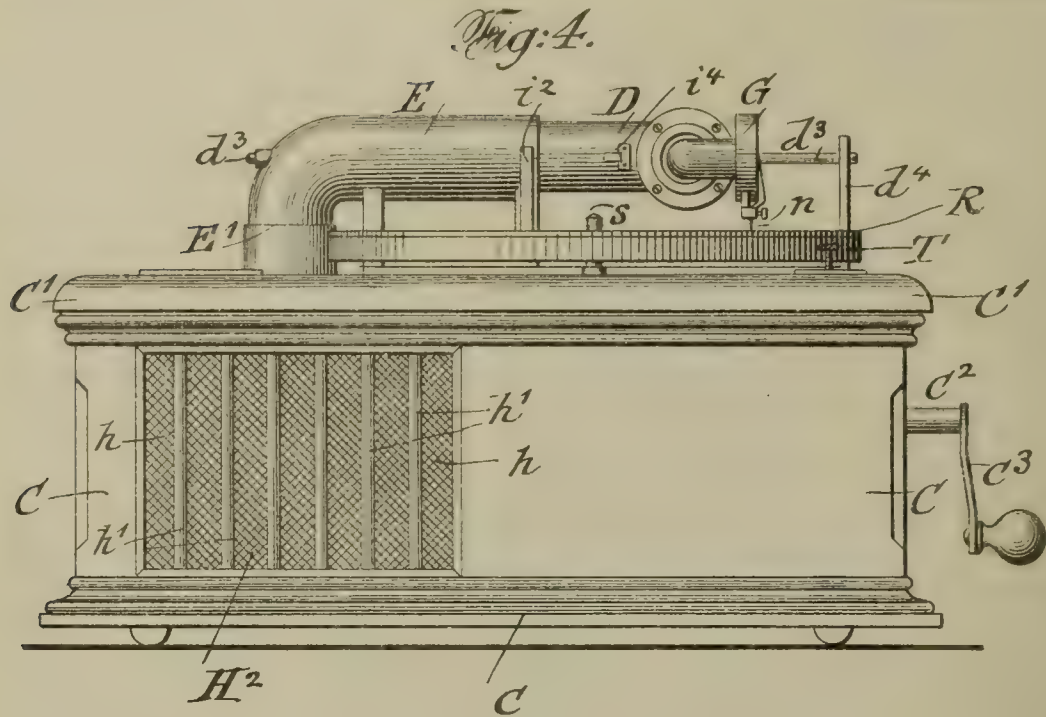
PHONOGRAPH.

APPLICATION FILED MAR. 26, 1909.

948,327.

Patented Feb. 8, 1910.

2 SHEETS—SHEET 2.



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PHONOGRAPH.

APPLICATION FILED MAR. 26, 1909.

948,327.

Patented Feb. 8, 1910.

3 SHEETS—SHEET 3.

Fig. 6.

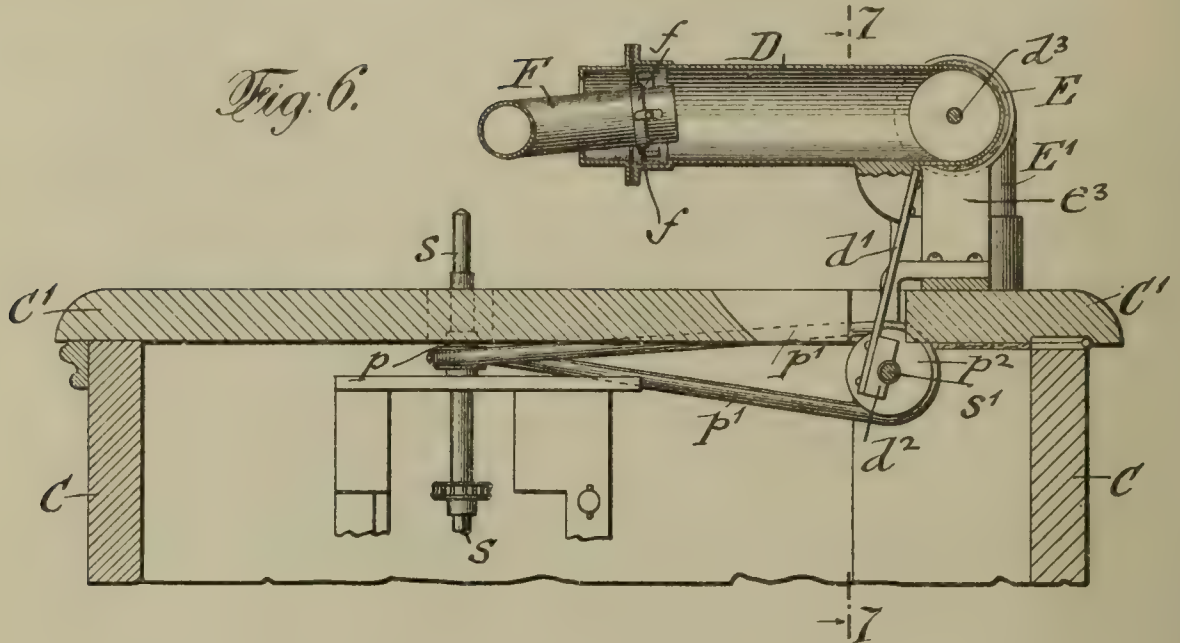


Fig. 7.

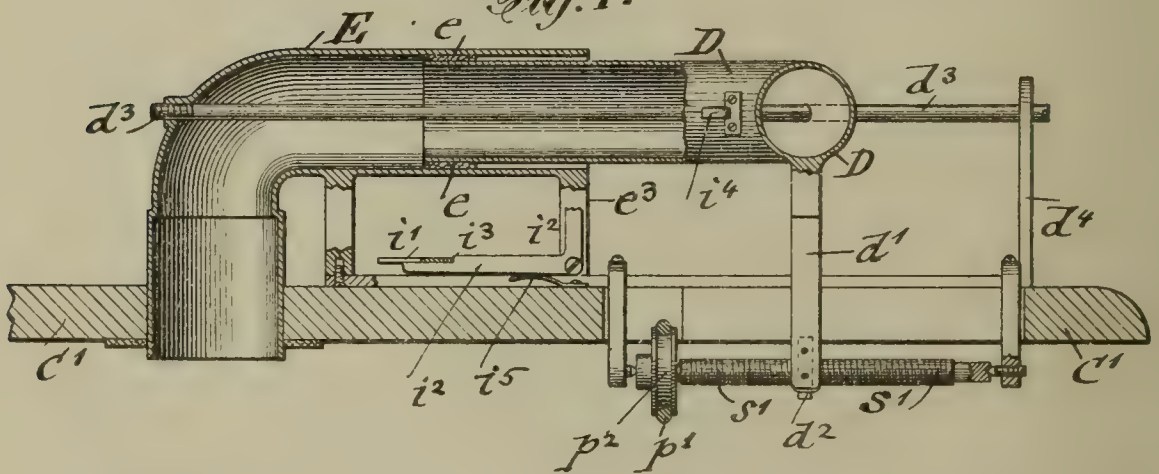
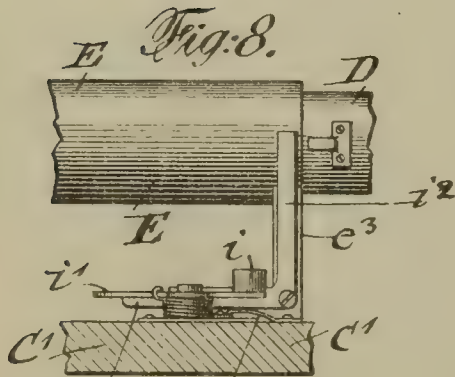


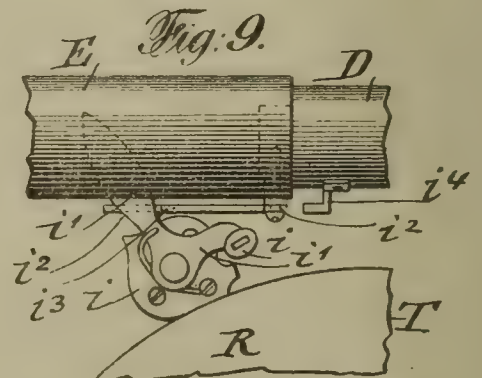
Fig. 8.



Witnesses:

H. J. Schrieves.
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Fig. 9.



Inventor

William H. Hoschke
By his Attorneys
James G. Gipe

UNITED STATES PATENT OFFICE.

WILLIAM H. HOSCHKE, OF NEW YORK, N. Y., ASSIGNOR TO SONORA PHONOGRAPH CO.,
A CORPORATION OF NEW YORK.

PHONOGRAPH.

948,327.

Specification of Letters Patent.

Patented Feb. 8, 1910.

Application filed March 26, 1909. Serial No. 485,875.

To all whom it may concern:

Be it known that I, WILLIAM H. HOSCHKE, a citizen of the United States of America, residing in New York, in the borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

This invention relates to an improved phonograph of that type in which no separate horn is used, but in which the same is arranged in the case in which the actuating motor for the record-carrying turn-table is arranged.

The horn used in phonographic apparatus is objectionable for the reason that it renders the apparatus cumbersome, as the horn takes up too much room, and that it impairs to some extent the clearness of the delivery of the phonographic records. By dispensing with the separate horn and its supporting stand, the entire apparatus becomes handier, more conveniently transportable, and more easily storable when not required for use.

In view of the foregoing, the invention consists of a phonographic apparatus in which the horn is arranged in the casing of the apparatus and operated in connection with a record placed on the rotating disk or turn-table by means of a stationary tube and a slidable sound-conveying tube which telescopes with said stationary tube. The telescoping tube is provided with a tube carrying the diaphragm-case, said tube being connected by a universal joint with the front-end of the telescoping tube. The motor which rotates the turn-table moves simultaneously the telescoping tube, diaphragm-chamber and stylus or needle so as to remove any strain on the latter.

The invention consists further of the combination of the tube carrying the diaphragm-case by a flexible joint with the telescoping sound-transmitting tube, and a sound-retaining web or sleeve, so that the needle moves in the grooves of the record with great facility and reduced friction.

The invention consists further in a stopping device by which the turn-table is automatically stopped when the needle arrives at the end of a record; and the invention consists lastly of certain details of construc-

tion and combinations of parts which will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a perspective view of my improved phonograph, Fig. 2 is a plan-view of Fig. 1, drawn on a larger scale, Figs. 3 and 3^a are respectively a vertical section and a horizontal section showing the flexible connection of the tube carrying the diaphragm-box with the telescoping sound-transmitting tube, drawn on a larger scale, Fig. 4 represents a front-elevation of the improved phonographic apparatus, Fig. 5 is a vertical transverse section on line 5, 5, Fig. 2, Figs. 6 and 7 are respectively a vertical transverse section on line 6, 6, and a vertical longitudinal section on line 7, 7, Fig. 2, and Figs. 8 and 9 are respectively a detail side-elevation and a plan-view of the automatic stopping device for the rotary disk or turn-table.

Similar letters of reference indicate corresponding parts throughout the different figures of the drawings.

Referring to the drawings, C represents the casing of my improved phonographic apparatus. The casing C is made of oblong shape and of a sufficient size to permit the placing in the same of the sound-delivering horn H and the spring-motor M by which the record-carrying disk or turn-table, as well as the telescoping sound-transmitting tube, is actuated. The case C is provided with a hinged lid C¹ to the under-side of which the spring-motor M is applied. Any approved construction of spring-motor can be used, preferably motors of that kind which are employed in the larger sizes of the well-known Swiss music-boxes. The motor is wound up from time to time by means of a shaft C² to which a crank-handle C³ is applied. The spring-motor M drives by a gear-wheel transmission *m*, *m*¹ the center-shaft *s* of the disk or turn-table T on which the disk-shaped phonographic record R is placed in the usual manner. From the shaft *s* of the turn-table T rotary motion is transmitted by a pulley *p* and belt *p*¹ located at the under-side of the lid C¹ to a pulley *p*² on a screw-spindle *s*¹ which is supported in suitable bearings at the under-side of the lid C¹, said screw-spindle driving, by means of a semi-circular screw-

nut d^2 located at the lower end of an arm d^1 which is attached at its upper end to a sound-transmitting tube D, the latter in sidewise direction, so that the same telescopes into a stationary tube E. The tube E passes by a downwardly-bent portion E^1 through an opening in the lid C^1 to the interior of the case C and connects there with the vertical portion or trunk H^1 of the speaking tube or horn H, which extends from the rear-wall of the case C toward the front-wall, and which is provided at its front-end with a suitable screen H^2 for preventing the ingress of dust to the horn. The case is provided, in front of the screened end of the horn H, with an opening h and upright rods h^1 for protecting the screened end H^2 , as shown clearly in Figs. 1 and 4. The horn H is preferably arranged at and parallel with the left-hand side of the case so as to permit the sounds to pass out through the opening in the front-wall of the case. It is supported in stationary manner in the case and is preferably made of wood, so that the sounds transmitted from the record are clearly transmitted to the listeners.

The telescoping sound-transmitting tube D is made of angular shape, one end being guided in the upper portion of the stationary tube E and provided with a packing e , of felt or other material, at its rear-end so as to slide easily and noiselessly in forward and backward direction in the tube E. The telescoping tube D is supported on a stationary guide-rod d^3 which is supported at one end in a bearing of the stationary tube E and at the opposite end on an upright arm d^4 attached to the lid C^1 . The guide-rod d^3 passes through a bearing of the telescoping tube D at its angular bend, as shown clearly in the different figures. The end of the tube E is also supported by a stationary standard e^3 on the lid C^1 . The front-end of the angular telescoping tube D carries by means of a universal joint f the rear-end of a short angular tube F to the front-end of which the diaphragm-box G is applied. The diaphragm-box carries the diaphragm and the holder for the stylus or needle n by which the sound-waves embodied in the grooves of the phonographic record are transmitted for reproduction by the diaphragm. The diaphragm-box G with its needle-holder is made in any approved manner. The universal joint f between the telescoping tube and the angular tube F is shown in Fig. 6 and in detail in Figs. 3 and 3^a, and serves to impart to the connection between the two tubes F and D the required degree of flexibility. The front-end of the telescoping tube D is connected by a fixed diametrical pivot-pin f^1 , which passes through slots o of the tube F, with a ring f^2 which carries by a second diametrical pivot-pin f^3 located at right angles to the pivot-pin f^1 , a second ring f^4 that is connected with the rear-end of the tube F of the diaphragm-box G, so that both are permitted to move freely on the front-end of the telescoping tube D without exerting any injurious strains by the needle or stylus n on the grooves of the phonographic record.

As the telescoping tube D is moved by its driving mechanism laterally into the stationary tube E, the flexible connection f imparts the required freedom of motion to the diaphragm-box and needle, but not the needle the movement to the telescoping tube, by which the rapid wearing of the needle as well as of the record is prevented. By the independent driving of the telescoping tube, the record is relieved from driving it, so that but little wear is produced on the record and the needle. Adjacent to the universal joint f is arranged a ring-shaped web or sleeve f^5 , which is held in position by an extension-tube f^7 at its outer circumference and which encircles by its inner circumference the inner end of the tube F so as to prevent the sounds from escaping at the flexible connection between the tubes D and F; in other words, making the connection sound-proof. The flexible connection between the tubes D and F also permits the lifting of the needle for introducing it into as well as for removing it from the record when starting or interrupting the piece of music represented on the record.

When it is desired to exchange the records, the telescoping tube D, with the tube F, diaphragm-box G and needle n , is lifted on its guide-rod d^3 into backwardly inclined position, so that the turn-table is entirely free and permits the easy removal of one record from and the placing of a new record on the same. Simultaneously with the lifting up of the telescoping tube, the segmental nut d^2 is removed from the driving screw-spindle, and thereby the telescoping motion of the tube interrupted.

When the tune represented by the record is played, the motion of the turn-table is automatically interrupted by a stop device, which is shown in detail in Figs. 8 and 9, and which consists of a brake-shoe i that is pressed against the circumference of the turn-table by means of a fulcrumed and spring-actuated lever i^1 . Adjacent to the rear-end of the lever i^1 is fulcrumed to the supporting post or standard e^3 of the tube E, an elbow-lever i^2 the lower arm of which passes under the spring-actuated stop-lever i^1 and engages the latter by a shoulder i^3 . A fixed stop i^4 on the telescoping tube D abuts against the upper arm of the elbow-lever i^2 when the tube D arrives at the end of its motion and releases the lever i^1 from the shoulder i^3 so that the brake-shoe i is instantly pressed on the circumference of the turn-table and arrests the motion of the same. When the turn-table is to be ro-

tated the lever i^1 of the stop device is moved against the tension of its spring until it is arrested by the shoulder on the lower arm of the elbow-lever i^2 . A flat spring i^5 acts on the underside of the lower arm of the elbow-lever i^2 so as to hold the same in contact with the stop-lever i^1 . When the telescoping tube D arrives at the end of its telescoping motion after the tune embodying the record has been played, the elbow-lever of the stop-lever is engaged by the stop on the telescoping tube and thereby the stop-lever released and the brake-shoe i applied to the turn-table and the motion of the latter arrested.

On the left-hand side of the case are located pockets k for different sizes of needles. These pockets are shown in Figs. 1 and 2. On the right-hand side of the case is arranged the button b by which the motor is started.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In a phonograph, the combination, with a record-carrying turn-table, and means for rotating the same, of a stationary sound-carrying tube, an angular tube telescoping in the stationary tube, means for moving the telescoping tube into the stationary tube, a diaphragm-box provided with a needle or stylus, a tube connecting the diaphragm-box with the front-arm of the telescoping tube, and a flexible connection between said tube and said front-arm, and an additional means on which the outer end of said telescoping tube is slidably supported.

2. In a phonograph, the combination, with a case, a record-carrying turn-table, and means for rotating the same, of a horn located in said case, a stationary tube of angular shape connected with said horn, an angular tube telescoping into the upper part of the stationary tube, means for holding said angular tube axially into line with the stationary tube, means for imparting reciprocating motion to the telescoping tube, a diaphragm-box provided with a needle or stylus, a tube connecting the diaphragm-box with the forward arm of the telescoping tube, and a flexible connection between said tube and the forward arm of the telescoping tube, a rod coaxial with said telescoping tube slidably supporting the same, and means for supporting said rod.

3. In a phonograph, the combination of a

stationary tube, an angular movable telescoping tube guided in the stationary tube, a diaphragm-box, a tube connecting the diaphragm-box with the forward end of the telescoping tube, and a flexible connection between said tube and the forward end of the telescoping tube, said flexible connection consisting of a universal joint formed of ring-shaped frames pivotally connected at right angles with each other, and a flexible sound-retaining web.

4. In a phonograph, the combination of a case, a hinged lid for the same, a motor attached to the under-side of said lid, a turn-table driven by said motor, a horn located in the case at one side of said motor and extending from the rear toward the front of the case, a sound-conveying tube secured to said lid and communicating with the horn, an angular sound-conveying tube telescoping into the stationary tube, means for moving the telescoping tube into the stationary tube driven from said motor, a diaphragm-box, a tube connecting the diaphragm-box with the forward end of said telescoping tube, and a flexible connection between said tube and the forward end of the telescoping tube.

5. In a phonograph, the combination, with a rotary turn-table, of a stationary sound-conveying tube, an angular tube telescoping in the same, means for imparting motion to the telescoping tube, and automatic means operated by the movement of the telescoping tube for arresting the motion of the turn-table when the telescoping tube arrives at the end of its movement.

6. In a phonograph, the combination, with a rotary turn-table, of a stationary sound-conveying tube, an angular telescoping tube guided in the stationary tube, means for imparting motion to the telescoping tube, a spring-actuated brake device, a lever for holding the same in position out of contact with the turn-table, and a stop device on the telescoping tube adapted to engage the lever for releasing the stop device and arrest the motion of the turn-table.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

WILLIAM H. HOSCHKE.

Witnesses:

PAUL GOEPEL,
H. J. SUHRBIER.

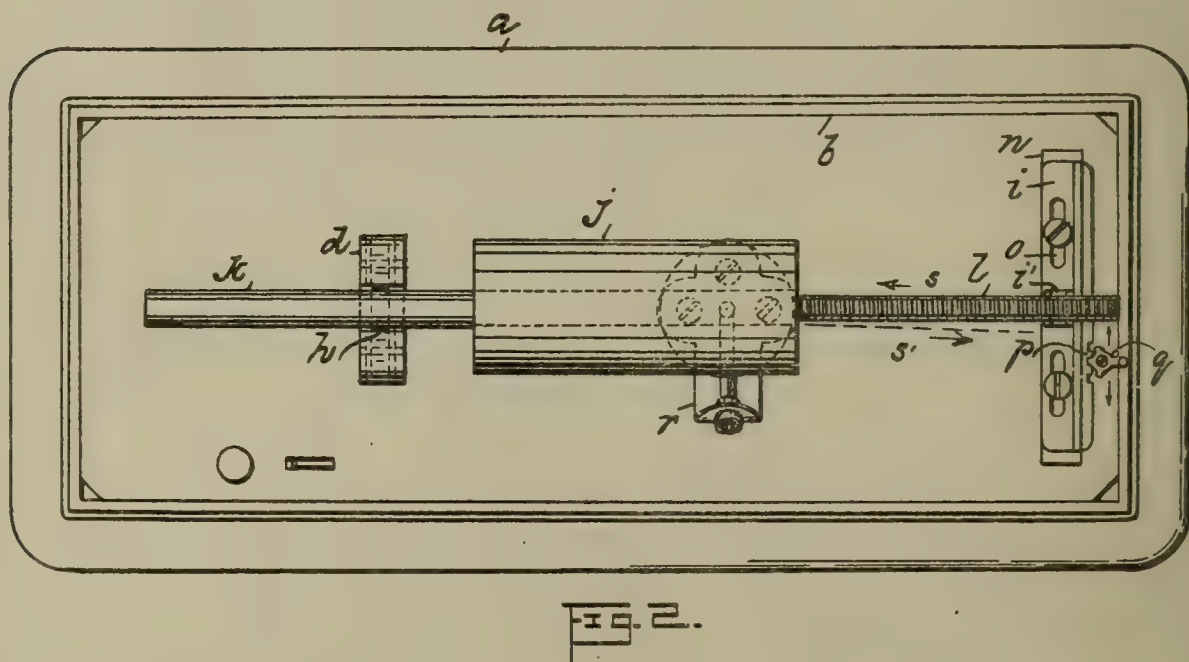
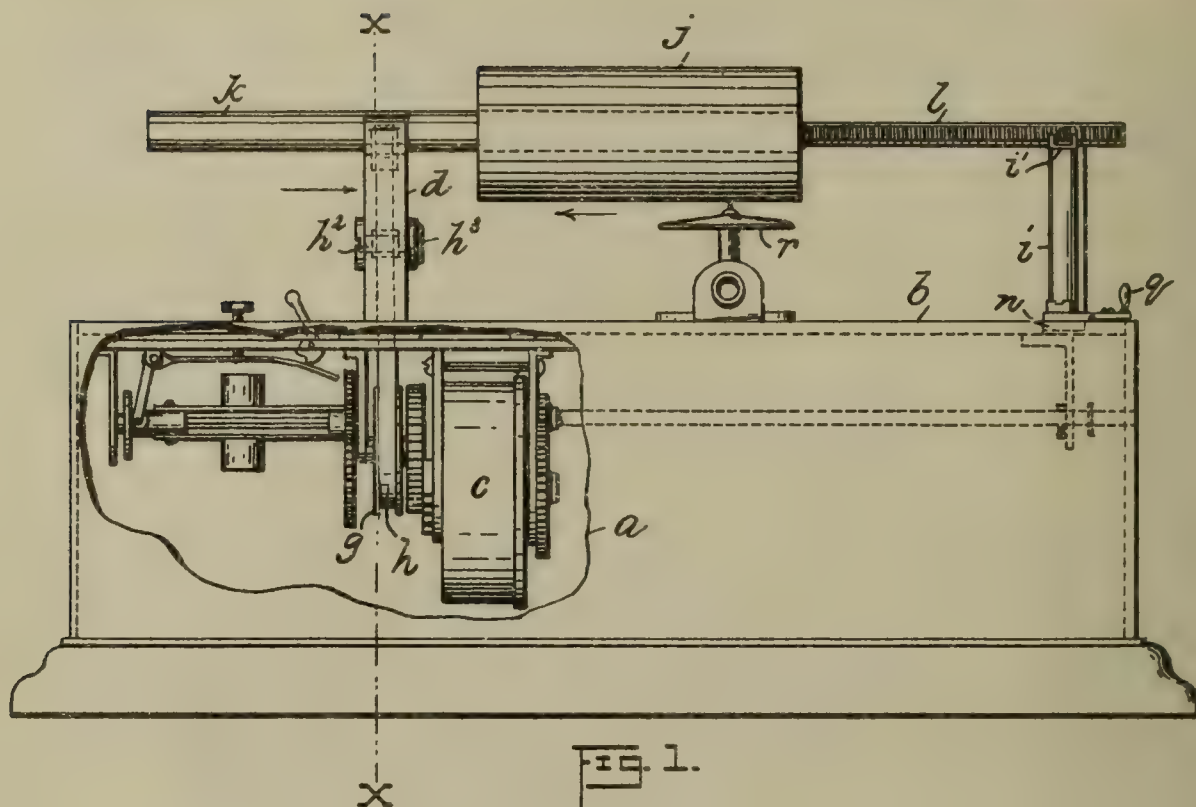
PHONOGRAPH.

APPLICATION FILED NOV. 15, 1908.

948,328.

Patented Feb. 8, 1910.

2 SHEETS—SHEET 1.



WITNESSES

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Helen L Carroll

INVENTOR

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PHONOGRAPH.

APPLICATION FILED NOV. 16, 1909.

948,328.

Patented Feb. 8, 1910.

2 SHEETS—SHEET 2.

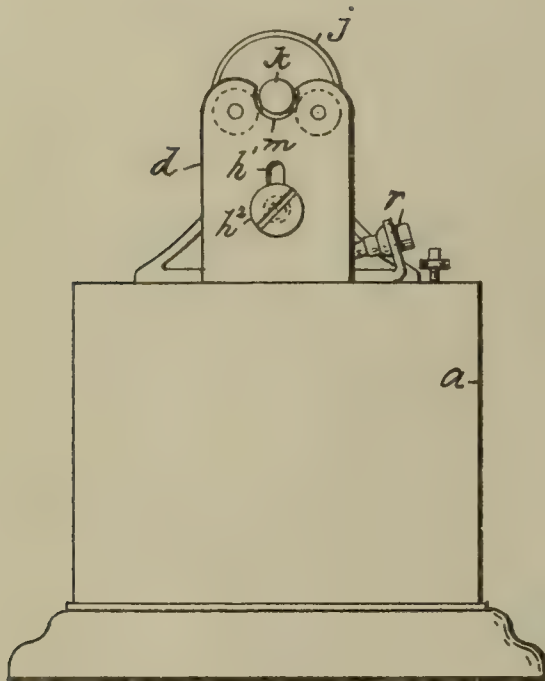


FIG. 3.

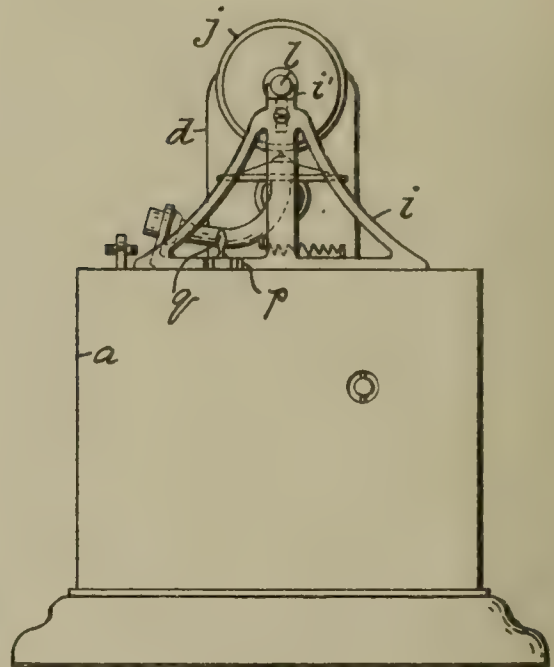


FIG. 4.

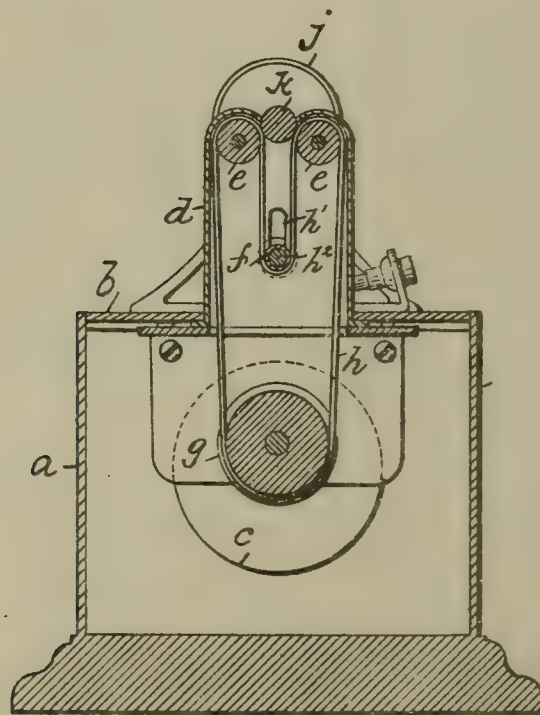


FIG. 5.

WITNESSES
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UNITED STATES PATENT OFFICE.

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PHONOGRAPH.

948,328.

Specification of Letters Patent.

Patented Feb. 8, 1910.

Application filed November 15, 1909. Serial No. 528,216.

To all whom it may concern:

Be it known that I, CHARLES M. HUGHES, a citizen of the United States, residing in the city of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographs, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it pertains to make, construct, and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of my invention is to increase the simplicity in construction and operation of the phonograph, by decreasing the number of parts of which the machine is composed, by lessening or avoiding the necessity for adjustment of the various parts in practice, and by increasing the convenience of manipulation of the machine. To this end, I have made many changes, all with the objects of increased simplicity, convenience, and efficiency.

Heretofore, it has been customary to rotate the mandrel shaft by directly connecting the same with the motor shaft by suitable pulleys, belts or gear wheels. One feature of my invention is an improvement upon this arrangement; and consists in rotating the mandrel shaft without directly connecting it to the motor shaft by means of pulleys, belts, gear wheels or the like, by causing said mandrel to rest upon and be rotated by frictional engagement with a belt which passes over a pulley on the motor shaft, and over a pair of pulleys and under an idler, which are conveniently secured in a case upon the top of the machine, and in which the mandrel shaft is supported and rotated.

In the accompanying drawings forming a part of this specification, Figure 1 is a side elevation of my improved machine, partly in section. Fig. 2 is a plan view. Figs. 3 and 4 are end elevations of the same; and Fig. 5 is a vertical sectional view taken on lines $x-x$ of Fig. 1, looking in the direction indicated by the arrow.

Similar letters of reference refer to like parts throughout the specification and drawings.

In the drawings, a represents the case of the machine and b the top, to the under side

of which is mounted in any convenient manner, a motor c of the usual type. A casing d of any desirable shape is secured to the top of the machine, and provided with two small pulleys e and an adjustable idler f . A driving pulley g is secured to the motor shaft, over which the belt h passes, which drives and also passes over the pulleys e and under the idler f , which are located in the casing d .

In the drawings, I have shown an elongated slot h' in both sides of the casing, through which a stud h^2 passes, upon which is loosely mounted the idler f , said stud being provided at one end with a knurled nut h^3 , which together with the stud affords a ready means for changing the vertical position of the idler, in order to adjust the belt h . An adjustable bracket i provided with a nut section i' is conveniently mounted upon the top b of the machine.

The phonogram mandrel j is mounted upon a shaft k and has extending from one side thereof, the feed screw l which is in engagement with the nut section i' . The bracket d in its top side, is cut away at m , so as to expose the belt h .

From the foregoing description, it will be seen that the phonogram carrying shaft k is in no way geared to the motor by gears or belts, as has been customary heretofore, but that the shaft k simply rests upon the belt h between the two pulleys e , and is driven by frictional engagement therewith, and that the other end of the shaft which is screw-threaded, is in engagement with the screw-threaded nut section i' by means of which the phonogram cylinder is slowly displaced in the direction indicated by the arrow. This construction enables me to drive the phonogram cylinder without the production of noise which would be detrimental in the operation of the instrument. It also makes the instrument exceedingly sensitive, and capable of reproducing sounds accurately.

The nut section i' is preferably swiveled on the top of the adjustable bracket i in any convenient manner, and adapted to receive the feed screw l which extends from one end of the phonogram mandrel j .

r represents a sound box of the usual type, conveniently secured to the top of the machine, and designed to receive a sound horn of the ordinary kind.

From the above description, it will be

apparent that I have produced a phonograph possessing the features of advantage enumerated as desirable, and I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, as obvious modifications will suggest themselves to those skilled in the art.

I claim:

10 1. In a phonograph, the combination of a motor, a frictionally driven phonogram carrying shaft, and means arranged upon said phonograph and driven by said motor for supporting and driving the phonogram
15 carrying shaft by frictional engagement with said means.

20 2. In a phonograph, the combination of a motor, a frictionally driven horizontal phonogram carrying shaft, and adjustable driving means arranged upon said phonograph and driven by said motor for supporting and driving said phonogram carrying shaft by frictional engagement therewith.

25 3. In a phonograph, the combination of a motor, a frictionally driven phonogram carrying shaft, a support provided with a nut section for supporting one end of said shaft, and driving and supporting means operated by said motor for supporting and
30 frictionally driving the other end of said phonogram carrying shaft.

4. In a phonograph, the combination of a motor, a frictionally driven phonogram carrying shaft, a support provided with a swiveled nut section for supporting one end of said shaft, and an adjustable driving and supporting means operated by said motor for supporting and frictionally driving the other end of said phonogram
40 carrying shaft.

5. In a phonograph, the combination of a motor, a pair of pulleys connected by a belt with the motor and a phonogram carrying shaft resting upon and supported by
45 said belt and driven by frictional contact therewith.

6. In a phonograph, the combination of a motor carrying a pulley, a pair of pulleys mounted in a casing and connected by a belt with the pulley on the motor, and a phonogram carrying shaft resting upon and supported by said belt and being driven by frictional engagement therewith. 50

7. In a phonograph, the combination of a motor, a pair of pulleys and an idler
55 mounted in a casing and connected by a belt with the motor, and a phonogram carrying shaft resting upon and supported by said belt and being driven by frictional engagement therewith. 60

8. In a phonograph, the combination of a motor carrying a pulley, a pair of pulleys mounted in a casing and connected by a belt with the pulley on the motor, a support provided with a swiveled nut section and a
65 phonogram carrying shaft resting upon said belt and swiveled nut section and being driven by frictional engagement with said belt.

9. In a phonograph, the combination of
70 a spring motor, a casing provided with a pair of pulleys and an idler, said pulleys and idler being connected by a belt with said spring motor, a support provided with a swiveled nut section and a phonogram carrying
75 shaft resting upon said belt and swiveled nut section and being driven by frictional engagement with said belt.

10. In a phonograph, the combination of a motor, a pair of pulleys and an adjustable
80 idler mounted in a casing, and connected by a belt with the motor, a support provided with a nut section and a phonogram carrying shaft resting upon said belt and support and being driven by frictional engagement
85 with said belt.

This specification signed and witnessed this 12th day of November 1909.

CHARLES M. HUGHES.

Witnesses:

FREDK. C. FISCHER,
C. A. ALLISTON.

P. M. RAVENSKILDE.

PHONOGRAPH.

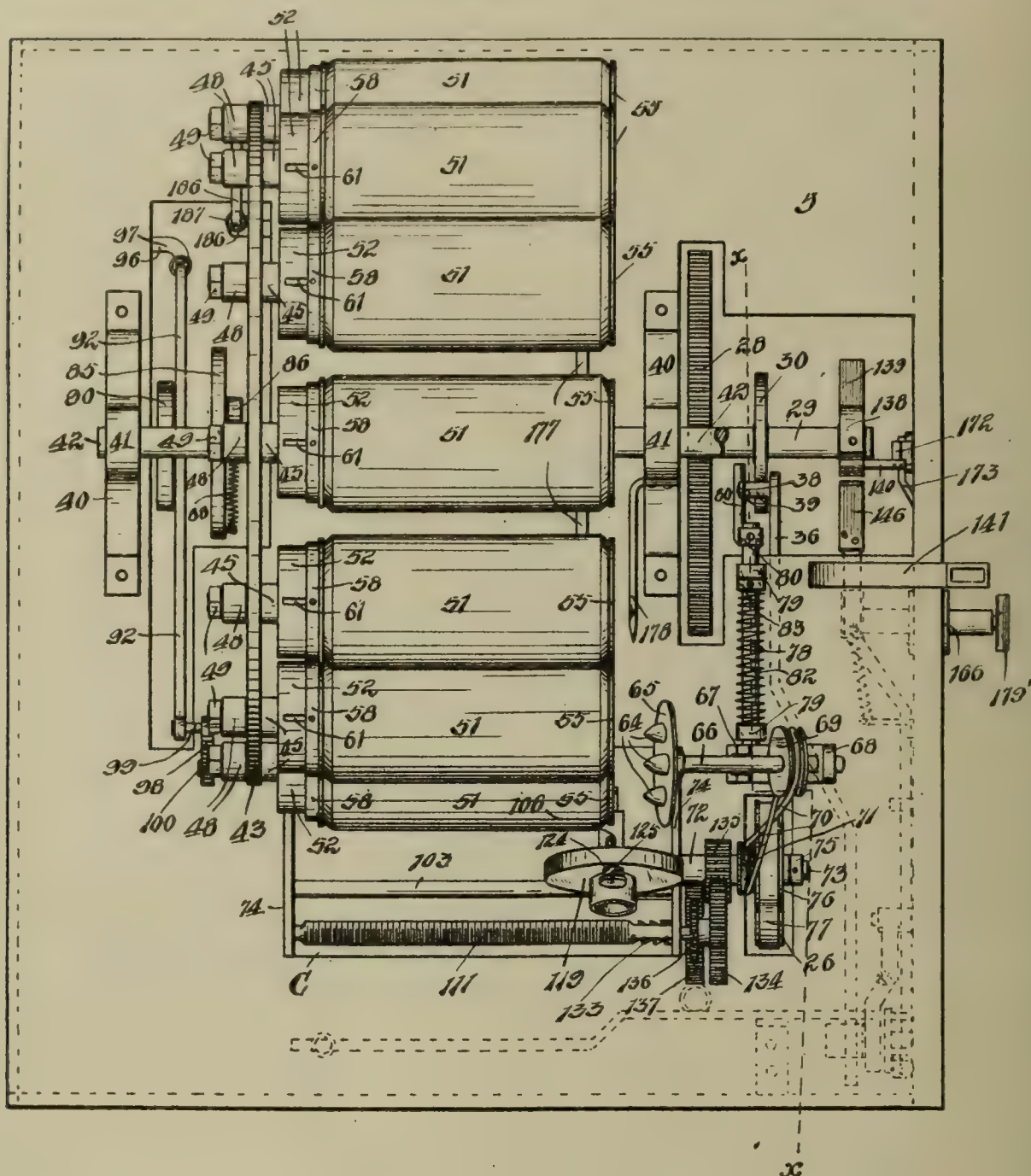
APPLICATION FILED OCT. 20, 1908.

948,675.

Patented Feb. 8, 1910.

7 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

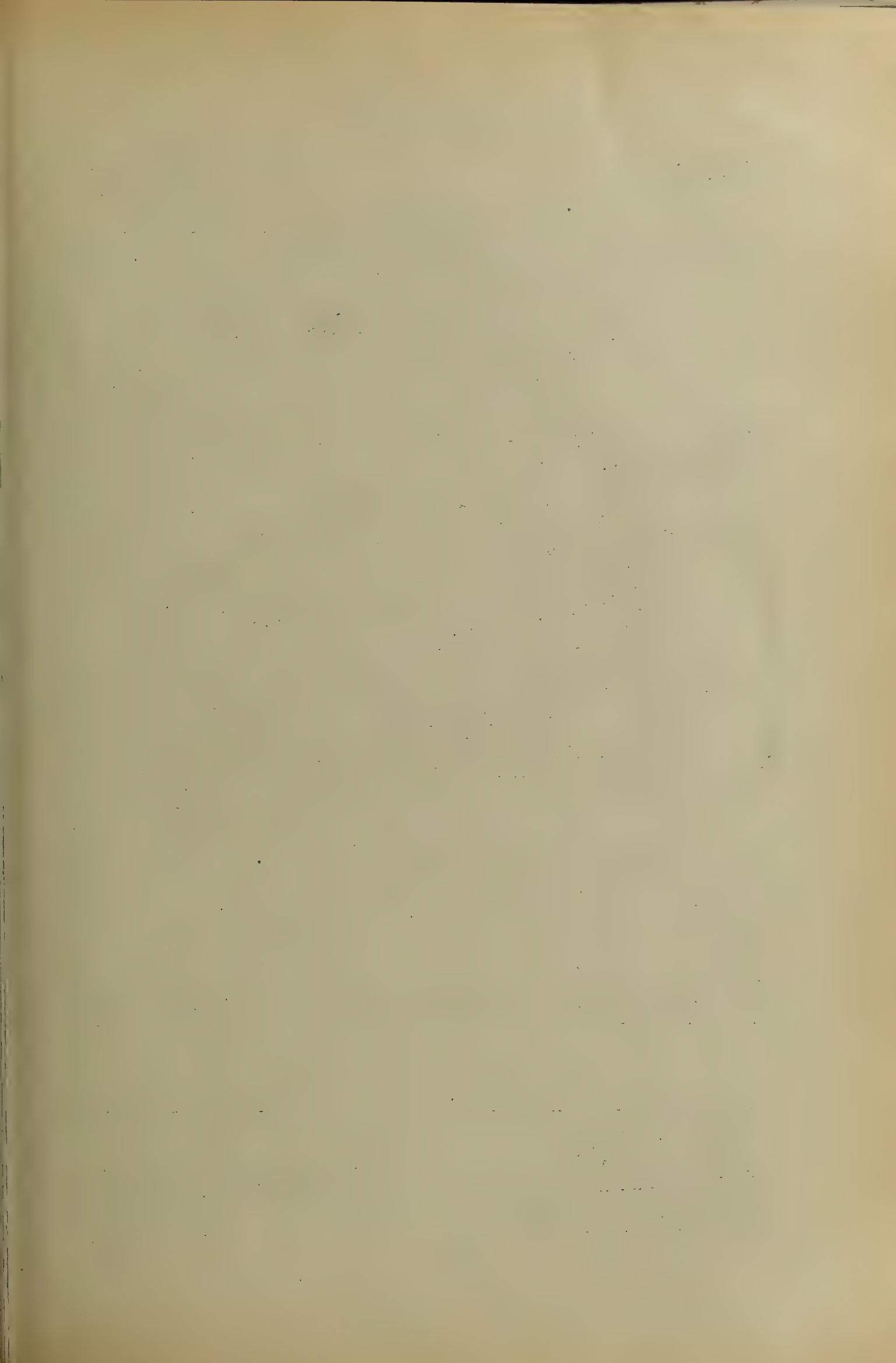
Fred H. Ransom

W. C. Smith

Inventor:

Peter M. Ravenskilde

By Joshua K. Torrey
Attorney.

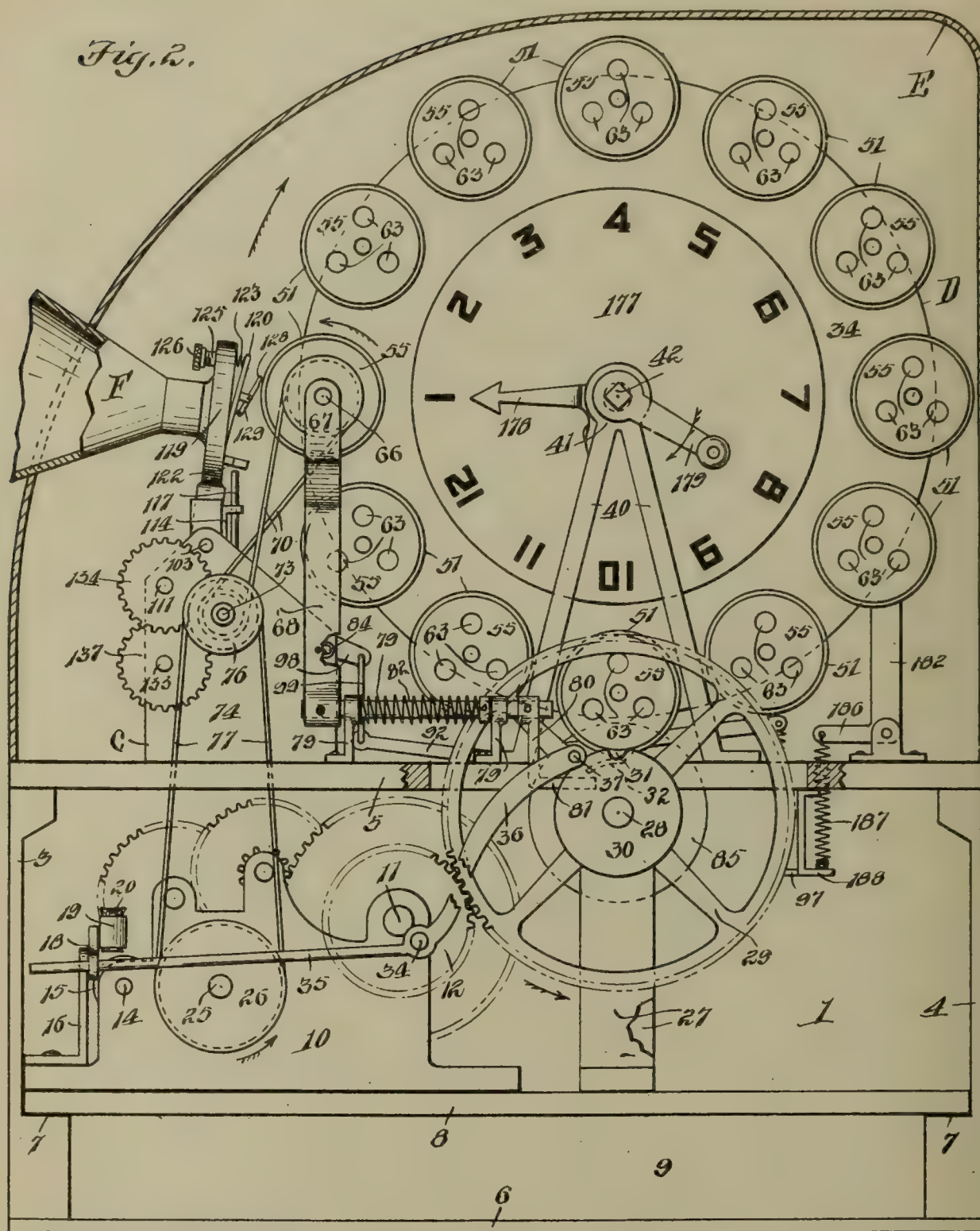


P. M. RAVENSKILDE.
 PHONOGRAPH.
 APPLICATION FILED OCT. 20, 1908.

948,675.

Patented Feb. 8, 1910.

7 SHEETS—SHEET 2.



Witnesses:
Fred J. Larson,
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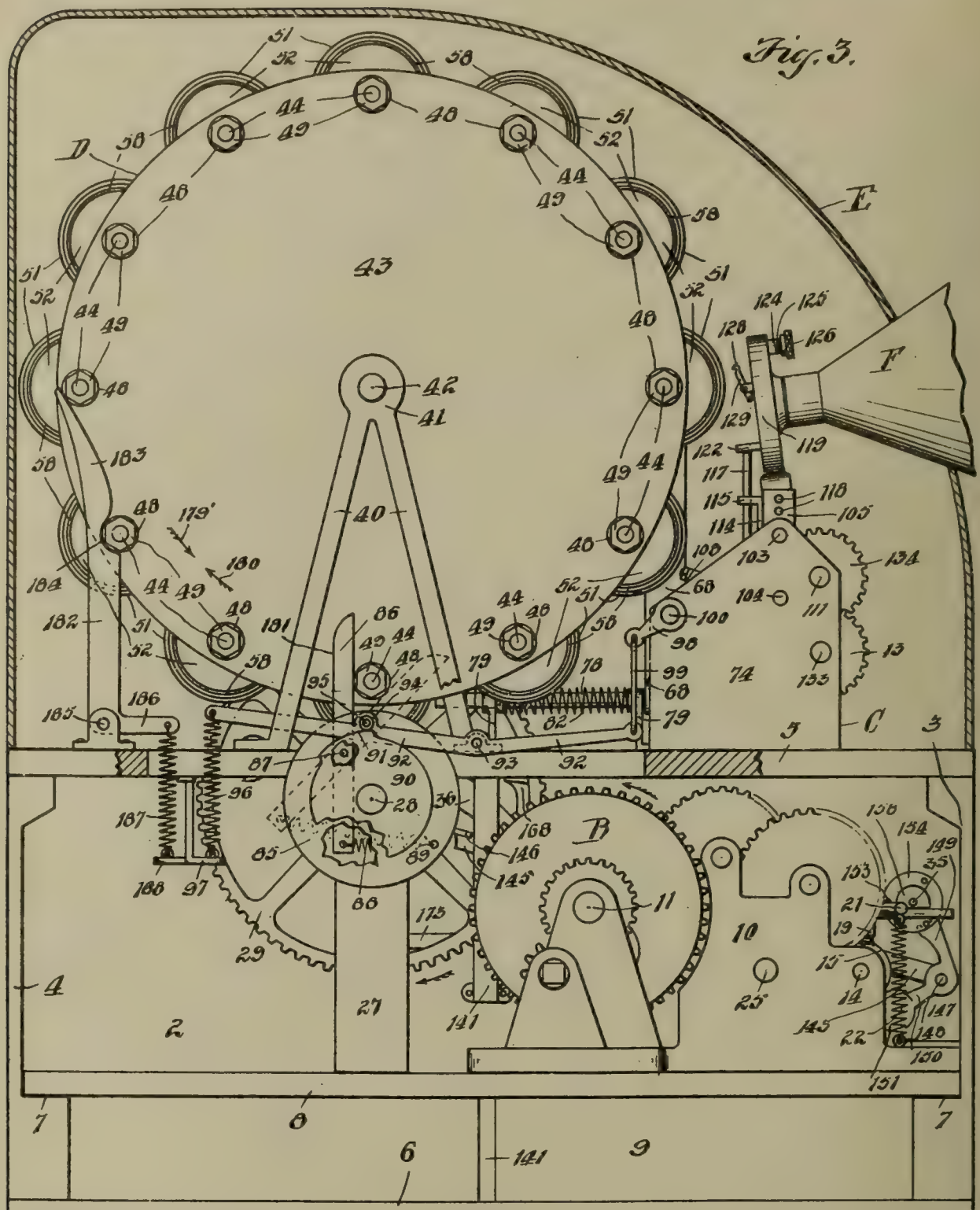
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P. M. RAVENSKILDE.
 PHONOGRAPH.
 APPLICATION FILED OCT. 20, 1908.

948,675.

Patented Feb. 8, 1910.

7 SHEETS—SHEET 3.



Witnesses:
Fred. H. Ransom,
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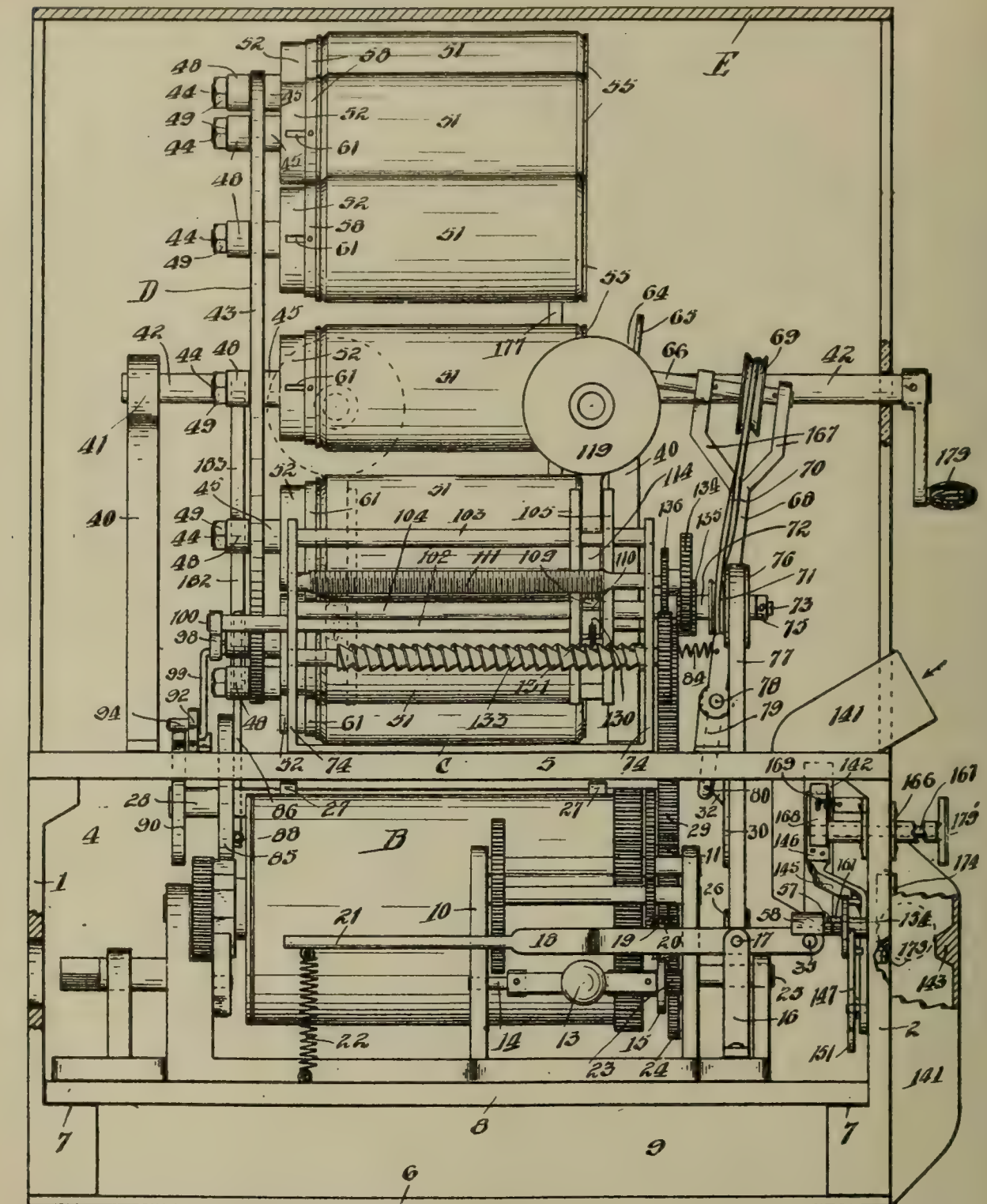
Inventor:
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P. M. RAVENSKILDE.
 PHONOGRAPH.
 APPLICATION FILED OCT. 20, 1908.

948,675.

Patented Feb. 8, 1910.

7 SHEETS—SHEET 4.

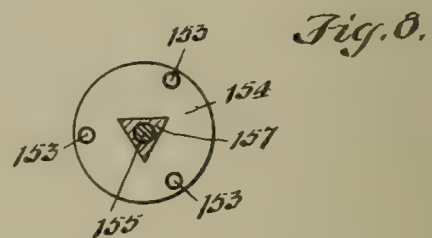
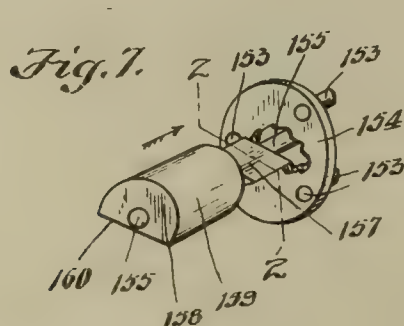
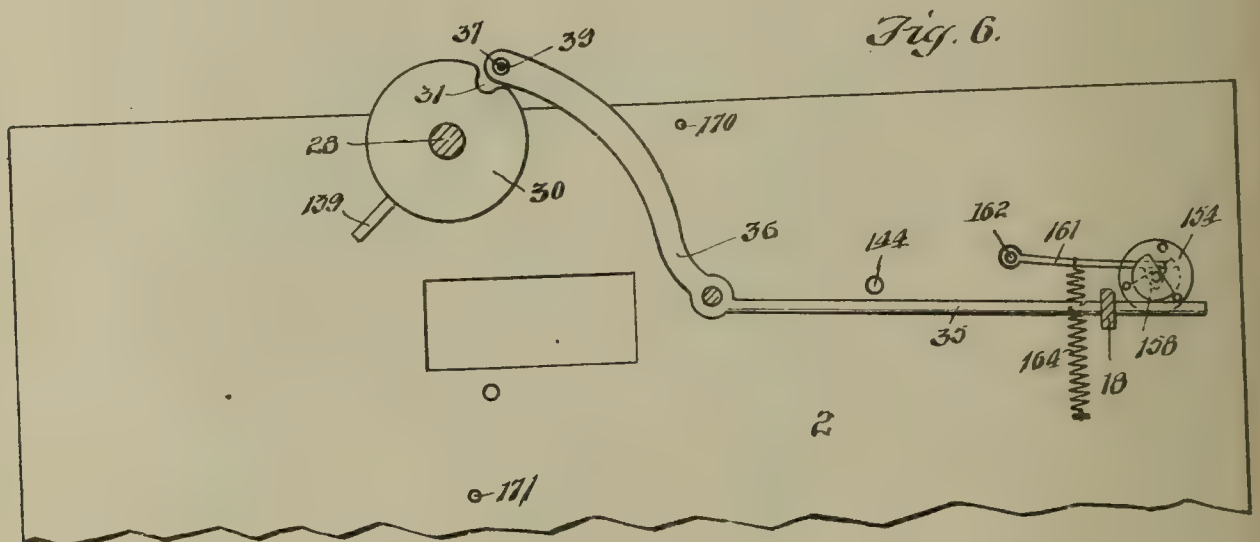
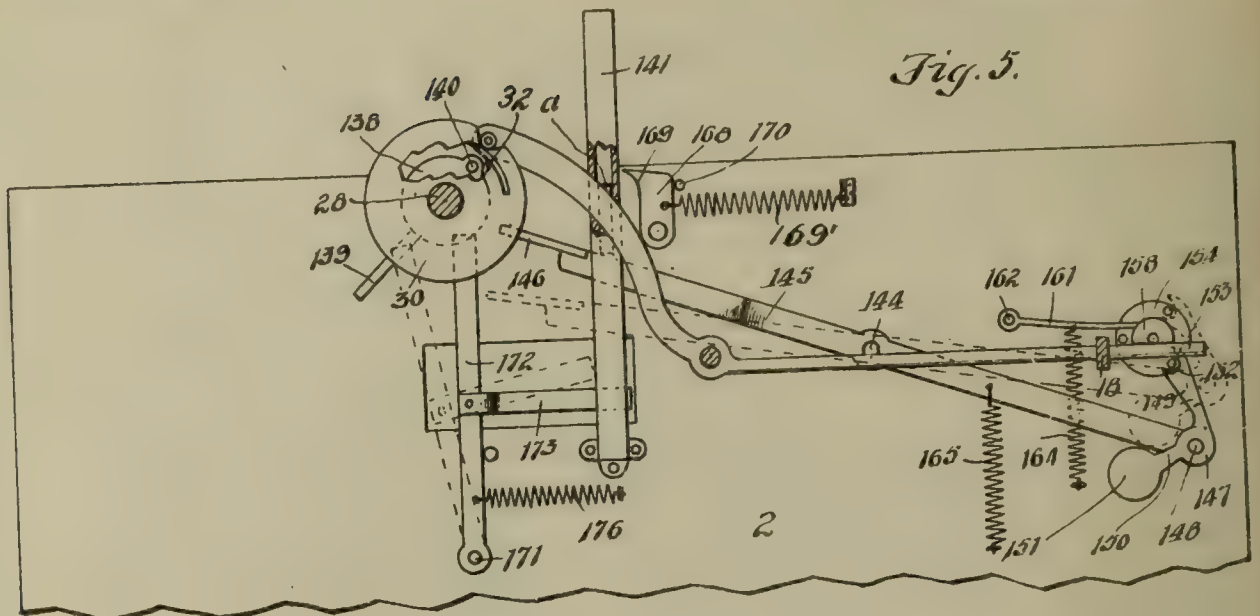


Witnesses:
Frederick Ransom
W. C. Smith

Fig. 4.

Inventor:
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 By *Joshua R. H. Ross*
 Attorney.

948,675.



Witnesses:
Frederick J. Larson
W. C. Smith

Inventor:
Peter M. Ravenskilde
 By *Joshua R. N. Lott*
 Attorney.

P. M. RAVENSKILDE.

PHONOGRAPH.

APPLICATION FILED OCT. 20, 1908.

948,675.

Patented Feb. 8, 1910.

7 SHEETS—SHEET 6.

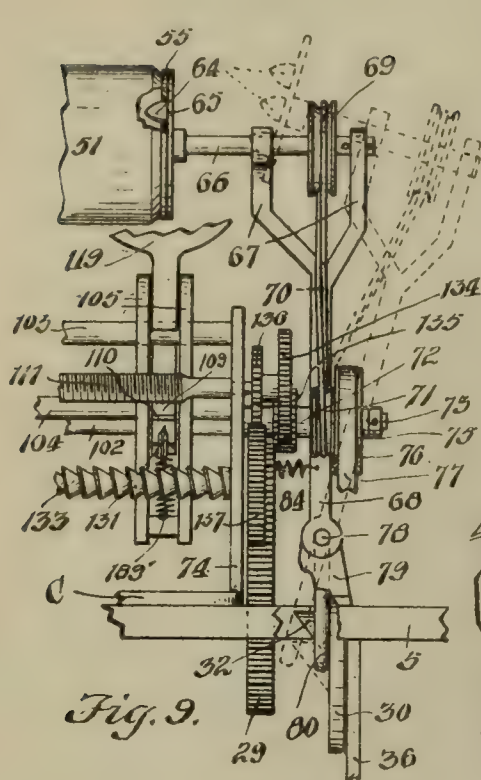


Fig. 9.

Fig. 11

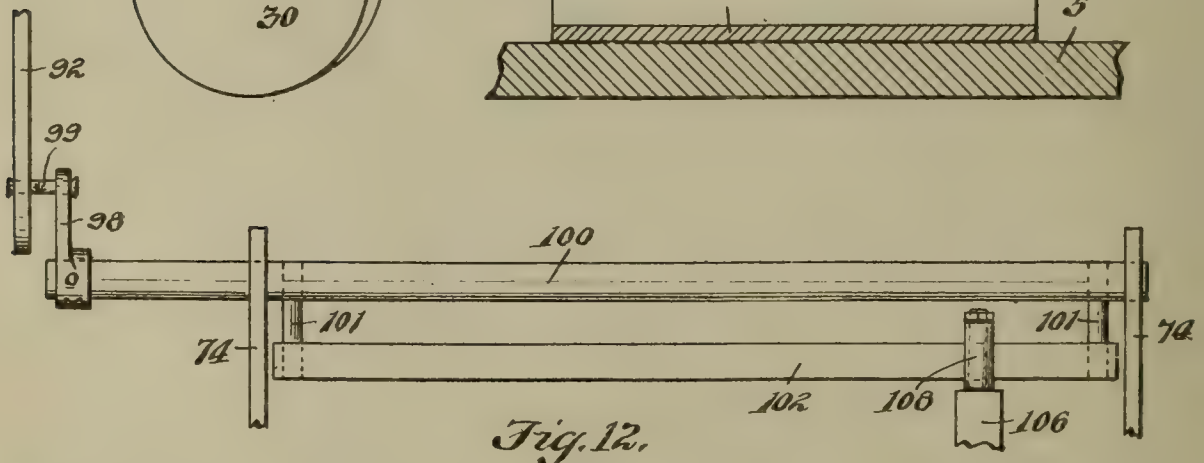
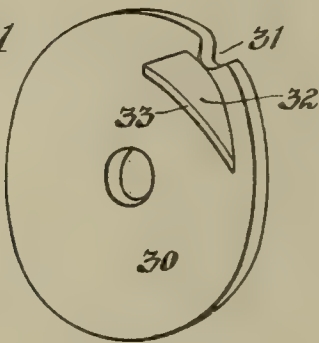


Fig. 12.

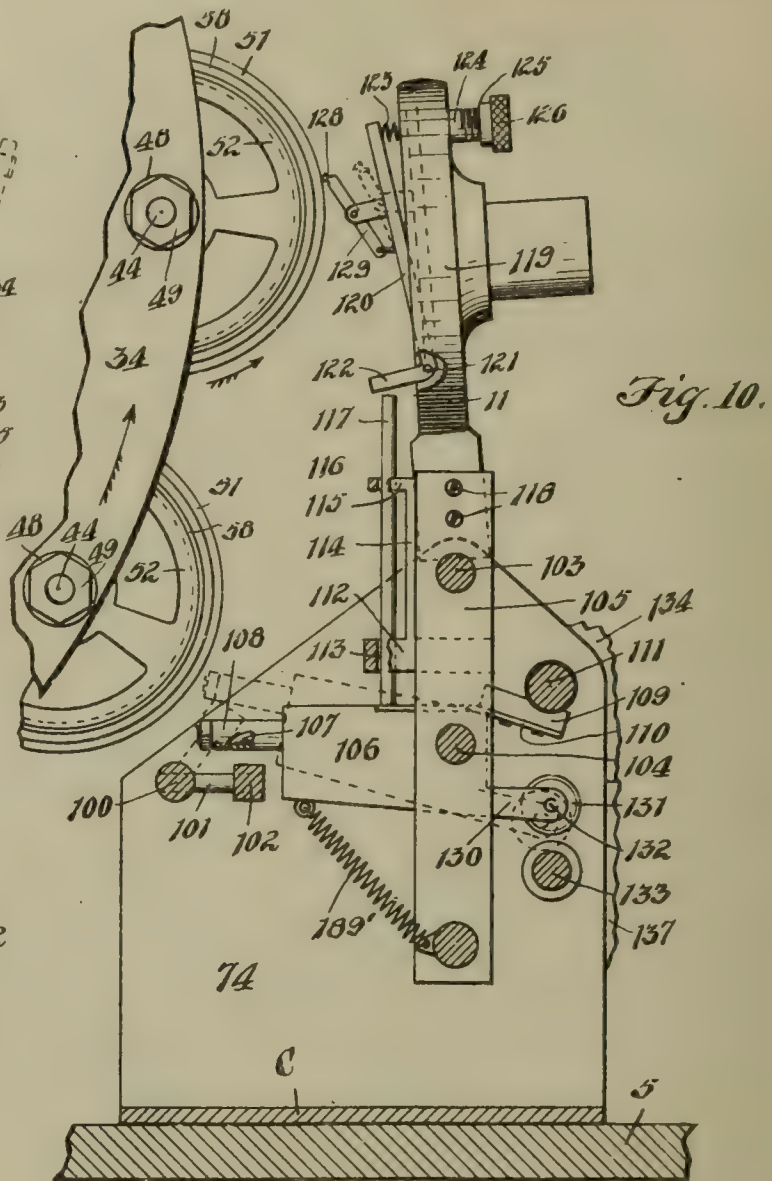


Fig. 10.

Witnesses:
Fred H. [Signature]
W. C. Smith

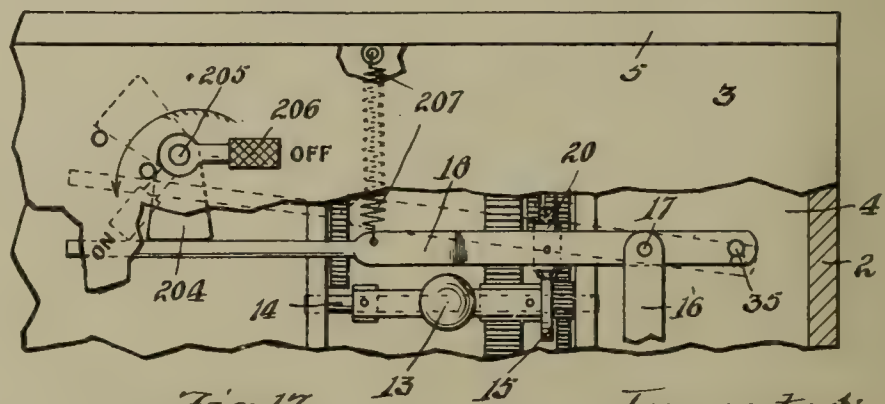
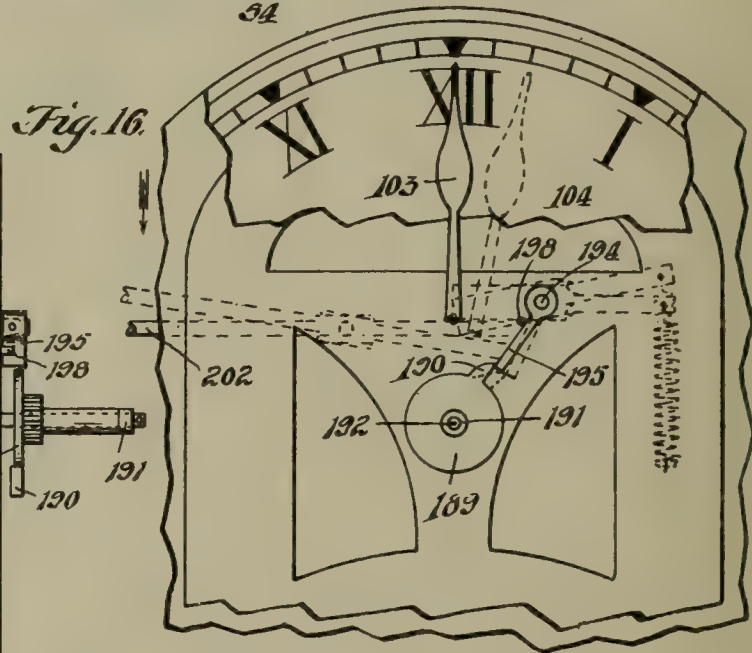
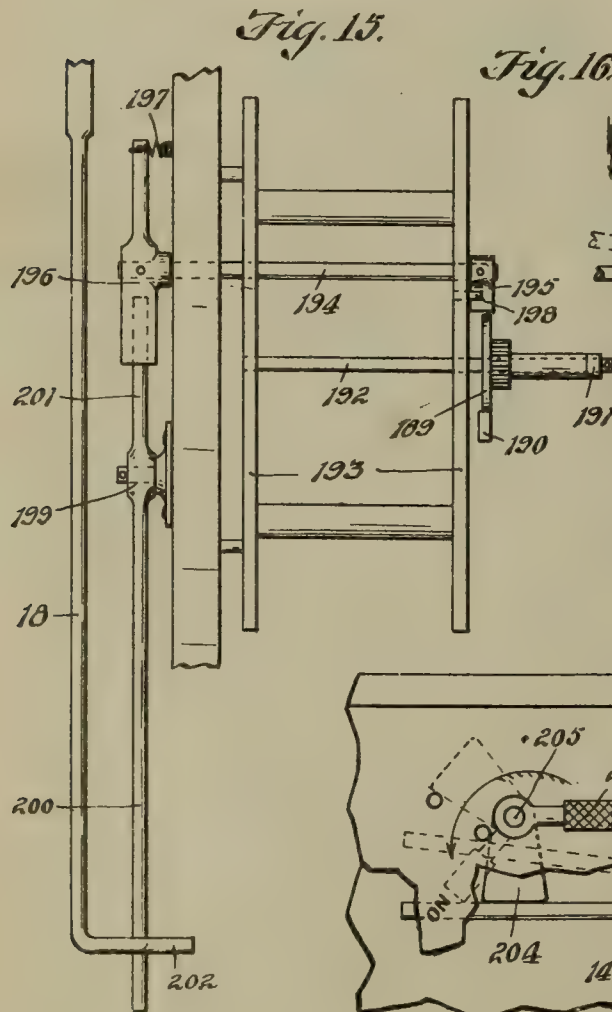
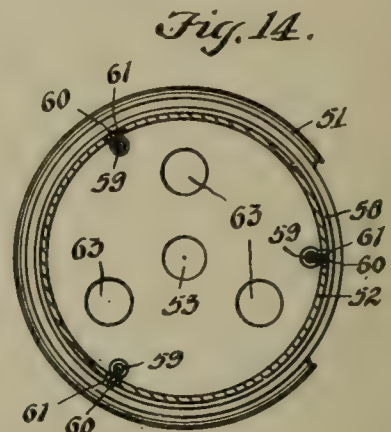
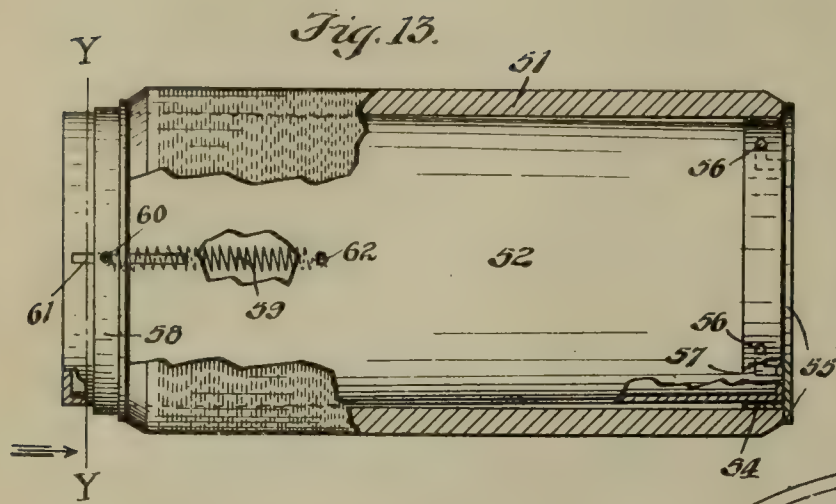
Inventor:
Peter M. Ravenskilde.
By *Joshua R. [Signature]*
Attorney.

P. M. RAVENSKILDE.
 PHONOGRAPH.
 APPLICATION FILED OCT. 20, 1908.

948,675

Patented Feb. 8, 1910.

7 SHEETS—SHEET 7.



Witnesses:

Fred. A. Larson,
W. C. Smith

Fig. 17.

Inventor:

Peter M. Ravenskilde.

By *Joshua K. H. H.*
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UNITED STATES PATENT OFFICE.

PETER M. RAVENSKILDE, OF CABERY, ILLINOIS.

PHONOGRAPH.

948,675.

Specification of Letters Patent.

Patented Feb. 8, 1910.

Application filed October 20, 1908. Serial No. 458,611.

To all whom it may concern:

Be it known that I, PETER M. RAVENSKILDE, a citizen of the United States, residing at Cabery, county of Ford, and State of Illinois, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

My invention relates to new and useful improvements in phonographs, and has for its object to provide a device of this character having a rotatable element adapted to carry a plurality of phonographic records to be played.

A further object is to provide a coin-actuated means for starting the motor.

A further object is to provide means adapted to intermittently rotate the record-carrying element a part of a revolution.

A further object is to provide a movable means adapted to intermittently engage and rotate one of the record-holders while the record carried thereby is being played.

A further object of the invention is to provide means for engaging and disengaging the needle of the reproducer with and from the phonographic records.

A further object is to provide means for automatically carrying the reproducer back to the starting point after having played a record.

A further object is to provide a mechanism adapted to release a brake lever to allow the motor to run long enough to cause two records to be played and then actuate said brake lever for stopping the motor.

A still further object is to provide a clock-controlled means for starting the motor.

With these and other objects in view my invention consists in the novel features of construction, arrangement and combination of parts as will be more fully described hereinafter, illustrated in the accompanying drawings, and finally pointed out in the claims hereto appended, it of course, being understood that I do not desire to limit myself to the exact construction and location of the several parts, but entitle myself to such advantages as in the form, size and minor details of construction that may fall within the scope of my invention without departing from the spirit or sacrificing any of the advantages thereof.

Referring to the drawings forming a part of this specification, wherein like characters of reference denote similar parts throughout the several views: Figure 1 is a plan view

of my invention with portions of the top thereof broken away. Fig. 2 is a right-hand side elevation of the phonograph with the side of the casing and parts attached thereto removed. Fig. 3 is a left-hand side elevation of the phonograph with the side of the casing thereof removed. Fig. 4 is a front elevation of the phonograph with the end of the casing thereof removed. Fig. 5 is a view taken on the line $x-x$ of Fig. 1 showing the levers and cams in their proper positions when the motor is stopped. Fig. 6 is a similar view showing the position the cam-operated lever assumes while the two records are being played. Fig. 7 is a perspective view of the cam element adapted to actuate the lever for releasing and engaging the brake lever with the governor friction wheel. Fig. 8 is a sectional view taken on the line $z-z$ of Fig. 7. Fig. 9 is a detail showing the means for automatically engaging one of the record-holders at a time for rotating same when playing the record, and the cam for disengaging said means from the record-holder when the record carried thereby has been played. Fig. 10 is a view showing the means for carrying the reproducer, and the means for engaging the needle with and disengaging the same from a phonograph record. Fig. 11 is a perspective view of the cam which actuates the means adapted to engage the record-holders for rotating the same. Fig. 12 is a plan view of the cam-actuated lever which causes the reproducer to travel back to the starting point after having played a record. Fig. 13 is a view partly in section of one of my improved record-holders. Fig. 14 is a sectional view thereof taken on the line $y-y$ of Fig. 13. Fig. 15 is a modification of my invention showing the clock-controlled means for releasing the brake lever from the governor frictional wheel for the length of time sufficient to play one record. Fig. 16 is a front view of a portion of the clock showing the cam and lever actuated thereby. Fig. 17 is a front view of the modification of my invention showing the brake lever actuated by means of a cam which cam is adapted to be actuated at will so as to play as many records as desired in succession.

When the means described in Figs. 15, 16 and 17 are employed, the coin and cam-actuated means may be discarded, or if desired, the coin and cam-controlled means may be used in connection with the clock mechanism.

ism but not with the cam element described in Fig. 17.

In carrying out the aim of my invention, I employ a suitable housing or casing A comprising the sides 1 and 2, the front 3, the back 4, the top 5 and the bottom 6. The sides 1 and 2, the front 3 and the back 4 are each provided with a shoulder 7 adapted to support the edges of the plate 8 upon which the motor B is suitably secured in position by means of any well known fastening devices. The compartment 9 formed between the bottom 6 and motor-supporting plate 8, is adapted to be used as a money compartment for receiving the coins which are placed in the coin-chute for causing the phonographic records to be played. The motor B is shown as a spring motor, although an electric motor may be employed, if desired. The spring motor B is mounted in a suitable frame 10 provided with a main drive shaft 11 journaled therein and upon the end of which is mounted or secured, a suitable gear 12. Located adjacent the motor B and adapted to be rotated thereby at any suitable speed, is a governor 13, the speed of which is governed by the amount of gearing connecting the governor-shaft 14 with the main-shaft 11 of the motor B. The governor-shaft 14 is provided with a friction wheel 15 as clearly shown in Figs. 2, 3 and 4.

Pivotally connected to the standard or bracket 16 by means of the pin 17, is a brake lever 18 which is provided with a holder 19 adapted to receive a felt or other suitable fabric element 20, which element is adapted to engage the periphery of the friction wheel 15 to stop the motor B when held in engagement therewith, as clearly shown in Figs. 2 and 4. The free or long end 21 of the lever 18 is connected with the motor-supporting plate 8 by means of the coil spring 22 which spring normally holds the lever 18 in a horizontal position so as to hold the fabric material 20 in engagement with the friction wheel 15 to prevent the rotation thereof.

Secured to the governor-shaft 14 adjacent the friction wheel 15 thereto, is a gear 23 which is adapted to mesh with a gear 24, which last-mentioned gear is adapted to be secured to the shaft 25 as clearly shown in Figs. 2 and 4. Secured to the outer end of this shaft 25 is a belt wheel 26 as shown in Fig. 2.

Suitably secured to the motor-supporting plate 8 adjacent the motor B, as clearly shown in Figs. 2 and 3, is a pair of suitably spaced brackets or standards 27. Journaled in the upper ends of the brackets 27 is a shaft 28 upon which is secured a gear 29 in mesh with the gear 12 secured to the main or motor-driven shaft 11 for rotating the shaft 28.

Secured to the shaft 28 adjacent the gear

29 is a cam 30 having its periphery provided with a recess or cut-away portion 31 and one of its outer faces provided with an approximately V-shaped projection 32 having the outwardly inclined cam-face 33. This projection 32, it will be observed, has its outer face come flush with the lowest surface of the recess 31. Pivotally connected upon the fixed stub-shaft 34, as clearly shown in Fig. 1, which shaft 34 is rigidly secured to the motor-frame 10, is a brake-actuating lever 35 having the upwardly and rearwardly extending portion 36 which has its end provided with an outwardly projecting pin 37 having the head 38 for holding the loosely mounted sleeve 39 upon the pin 37. When the motor B is stopped the brake lever 18 is in its horizontal position, as clearly shown in Figs. 1, 2 and 3, the sleeve 39 being adapted to seat in the recess or cut-away portion 31 of the cam 30.

Suitably secured to the top of the housing or casing A is a pair of suitably spaced supports or brackets 40. Journaled within the upper ends 41 of these supports or brackets 40 is a shaft 42 adapted to be located in vertical alinement with the shaft 28. Rigidly secured to the shaft 42 near the left-hand end thereof, is a vertically disposed record-supporting plate 43. This plate 43 is provided with a plurality of horizontally disposed shafts or rods 44 which are threaded into the plate 43 near the edge thereof, and provided with a shoulder 45, as clearly shown in Fig. 4. The end of the shaft 46 adjacent the threaded portion 47 is adapted to receive a loosely mounted collar 48 which is held in position by means of the bur 49.

The horizontally disposed shafts or rods 44 preferably twelve in number, are each provided with a rotatably mounted phonographic record-holder 50 adapted to hold the record 51 firmly in position thereon. Each of these record-holders, as more clearly shown in Fig. 13, consists of a metallic tubular element 52 tapering toward the end where the record 51 is first placed when in the act of placing the same on the record-holder. Each end of the record-holders 52 is closed or partly closed, and provided with an opening 53 for the reception of the supporting shafts or rods 44, as clearly shown in Fig. 4. The outer or smaller ends of the record-holders 52 are each provided with a removable ring 54 having the flange 55 for engaging the outer end or surface of the phonograph records 51. The ring 54 is provided with a plurality of inwardly projecting pins 56 adapted to be inserted into the right angular slotted openings 57 for normally locking said ring to the record-holder 52, and for guarding against the record becoming loose upon the holder and working its way off one end thereof. The opposite or larger ends of the record-hold-

ers 52 are each provided with a movable ring 58 having a flange adapted to engage the outer edge or surface of a record 51, as clearly shown in Fig. 13. This ring 58 is normally held in contact with the outer edge or surface of the record 51 by means of the coil springs 59 located within the record-holders 52 and connected at one end to the pins 60 projecting inwardly from the ring and extending into the interior of the record-holders through the slotted openings 61, and the opposite ends of the springs are each secured to an inwardly projecting pin 62. By this arrangement, it will be readily seen that the spring held ring 58 will take up all expansion and contraction of the records, thereby firmly holding the same in position by means of the rings 54 and 58 as well as by the well known manner of forcing the records upon the record-holders. The smaller ends of the record-holders 52, it will be observed, are provided with three openings 63, each of which openings is adapted to receive a cone-shaped lug 64 secured to the inner face of the plate 65, as clearly shown in Figs. 1, 2 and 9.

The plate 65 is rigidly secured to the inner end of the shaft 66 which is journaled in the forked end 67 of the vertically disposed arm 68. The shaft 66 is also further provided with the belt wheel 69 over which is adapted to pass a crossed belt 70, which is also adapted to run over the belt wheel 71, secured to the sleeve 72, which is loosely mounted upon the shaft 73, and which in turn is rigidly secured to one of the upper end plates 74 of the reproducer-supporting frame C. The sleeve 72 is held from slipping off the shaft 73 by means of the collar 75 which is secured thereto by means of a set-screw or the like. The sleeve 72 is further provided with a second belt wheel 76, preferably integral with the belt wheel 71 over which runs the belt 77, which at its lower end is adapted to run over the belt wheel 26, which latter wheel 26 is adapted to be rotated by means of the motor B for driving the aforesaid belts, as clearly shown in Fig. 2. The aforesaid vertically disposed arm 68, it will be observed from Fig. 2 of the drawings, is secured at its lowermost end to one end of the horizontally disposed shaft 78 journaled within the bearings or brackets 79. The opposite end of the shaft 78 is provided with a depending arm 80 having the lower right angular end 81 which is adapted to engage and be actuated by means of the cam-face 33 of the cam 30, as shown in Figs. 1, 9 and 11, for automatically disengaging the plate 65 from the end of the record-holder 52 after the record carried thereby has been played, as clearly shown in dotted lines in Fig. 9.

The shaft 78, it will be noticed from Figs. 1 and 2 is rotated by means of a coil spring

82 and a horizontally adjusted collar 83, the object of the spring 82 being to allow the center of the shaft 66 to easily and readily adjust itself with the center of the record-holders 52 owing to the fact that some of the record-holders 52 are apt at times to be out of alinement with the shaft 66, and unless the shaft could readily adjust itself the lugs 64 of the plate 65 could not enter the openings 63 in the outer or smaller end of the record-holders for revolving the same. The arm 68 is normally held in a vertical position so as to cause the plate 65 to engage the outer or smaller end of the record-holders 52, as clearly shown in Fig. 9, by means of the coil spring 84, which spring further holds the right angular end 81 of the arm 80 in engagement with the inner face of the cam 30, as clearly shown in Fig. 9 so that when the face 33 engages the same it will cause the arm 68 to be carried into the position shown in dotted lines.

Referring to Figs. 1, 3 and 4, it will be seen that I provide the left end of the driving-shaft 28 with a wheel 85 having an arm 86 pivotally connected to the inner face thereof by means of the pin 87 near the edge thereof. The lower end of the arm 86 is connected with a coil spring 88 the opposite end of which is connected or secured to the pin 89. This spring 88 normally holds the lower end of the arm 86 in engagement with the shaft 28, as shown in Fig. 3, which shaft acts as a stop for the arm as is manifest. The upper end of the arm 86, it will be observed, is adapted to engage one of the loosely held collars 48 at each revolution of the wheel 85 which will be more fully described hereinafter in the operation of the device.

Secured adjacent the outer face of the wheel 85 and upon the shaft 28 is a cam 90 having the cam-face 91, which is adapted to actuate an operating lever 92 pivotally held in position by means of the pin 93. The lever 92 is provided with a loosely held collar 94 upon the pin 95 which collar 94 is adapted to engage the periphery of the cam 90. The rear end of the lever 92 is connected to a coil spring 96 the opposite end of which is connected to a suitable bracket 97 secured to and depending from the top plate 5 of the housing or casing A. The spring 96 normally holds the collar 94 in engagement with the periphery of the cam 90. The front or forward end of the lever 92 is connected to an arm 98, as clearly shown in Fig. 3 by means of the link 99. The arm 98 is secured to the projecting end of the rod or shaft 100, as clearly shown in Figs. 3 and 12, which rod 100 is journaled in the upper end plate 74 of the reproducer-supporting frame C. The shaft 100 has connected with it by means of the pins 101 and running parallel therewith, a rod 102, which

rod is suitably spaced from the shaft 100, as clearly shown in Figs. 10 and 12. The rod designated 102 is adapted to actuate the reproducer-supporting element, which will now be described.

Rigidly secured to the end plates 74 of the frame C, as clearly shown in Figs. 4 and 10, is a pair of spaced supporting guide rods 103 and 104 located in vertical alinement as shown. These rods 103 and 104 pass through suitably spaced and vertically disposed bars 105 adapted to act as a reproducer-supporting carriage. Loosely mounted upon each rod 104 between the two upright bars 105 is a carriage block 106 having the rearwardly projecting pin 107 upon which is rotatably mounted a collar 108, which collar is adapted to engage the rod 102 when the carriage block 106 is in the position shown in dotted lines in Fig. 10. When the carriage block 106 is in the position shown in full lines in Fig. 10, the phonograph is in the act of playing a record, and it will be observed that the threaded plate 109 which is suitably secured to a spring arm 110 which in turn is suitably secured to the top of the carriage block 106, is in engagement with the finely threaded rod 111 journaled in the end plate 74 of the frame C.

Rigidly secured between the carriage bars or arms 105 and a suitable distance above the carriage block 106, is an arm 112 having an opening 113 therein. Integral with the arm 112 and extending upwardly therefrom, is an arm 114 having an outwardly projecting ear 115 provided with the opening 116. Adapted to be loosely held within these openings 113 and 116, is a vertically disposed rod 117 which is adapted to rest upon the top of the carriage block 106, as clearly shown in Fig. 10. The object of this rod 117 will be described hereinafter. Adjustably secured by means of the set-screws 118 to the upper ends of the carriage bars or arms 105, is the reproducer 119. The reproducer 119 is provided with an arm 120 pivotally held by means of the pin 121. The lower end of this arm 120 is provided with the right angular end 122, which when in the position shown in full lines in Fig. 10 is adapted to seat adjacent the upper end of the pin or rod 117. The upper end of the pivotally held arm 120 is connected to a coil spring 123, a portion of which is adapted to be held in the tubular element 124 rigidly secured to the reproducer 119. This tubular element 124 is provided with a plurality of external threads 125 to allow an internally threaded cap 126 to be secured thereto. Adapted to engage the inner face of said cap 126 is a pin 127 which at its opposite end is adapted to engage the free end of the coil spring 123. By this arrangement, it will be observed, I may adjust the

lever or arm 129 so as to cause the needle 128 secured to the pivotally held arm 129 to either press lightly or hard against the records 51 to produce a light or loud sound from the record. By turning the cap 126 in one direction, it will cause the pin 127 to engage the spring 123 causing it to exert more pressure against the arm 120 than by turning the cap in the opposite direction which causes the spring pressure against the arm 120 to be weakened. When the cap 126 is in the position shown in dotted lines in Fig. 10, it will be noticed, that the pin or rod 117, is adapted to engage the right angular end 122 of the arm 120 causing said arm to take the position shown in dotted lines, thereby automatically disengaging the needle from the record 51 immediately after the same has been played in order to allow the reproducer-supporting carriage to travel to the left or starting point without allowing the needle 128 to engage the record or record-holder which would naturally cause the same to scratch or destroy the same.

The carriage block 106, it will be observed, is provided with an upwardly extending arm 130 having its end forked to allow for the reception of the disk 131, which is pivotally held in position by means of the pin 132 and adapted to engage the worm-shaft 133 when in the position shown in dotted lines in Fig. 10 for causing the reproducer carriage to travel to the left or starting point. It will be observed, that when the threaded bar 109 is in engagement with the threaded shaft 111, that the disk 131 is out of engagement with the worm-shaft 133 and just the reverse when the threaded bar is out of engagement with the threaded shaft 111. The threaded shaft 111 is adapted to cause the reproducer-supporting carriage to travel to the right and the worm-shaft 133 is adapted to cause the same to travel toward the left. The right-hand end of the threaded shaft 111 is provided with the gear 134 which is adapted to mesh with, and be driven by means of the gear 135 secured to the loosely mounted sleeve 72. The threaded shaft 111 is still further provided with the gear 136, which gear is adapted to mesh with the gear 137 secured to the worm-shaft 133 driving the same in the opposite direction to the threaded shaft 111.

In Fig. 2 of the drawings, it will be observed that the reproducer 119 is provided with the suitable horn c.

The coin-controlled mechanism will be described.

Referring to Figs. 1 and 5 of the drawings, it will be observed I provide the driving shaft 28 with a cam 138 having the spring arm 139 which is suitably secured thereto. Oppositely disposed from the spring arm 139 and projecting outwardly from the side face of the cam 138, is a pin

140. The mechanism the spring arm 139 and pin 140 are adapted to actuate, will now be described.

Suitably secured to the side wall 2 of the housing or casing A is a coin-chute 141 which is provided with a slotted opening 142 and a lug 143, which lug is located in the coin-passage, as clearly shown in Fig. 4.

Pivotally secured by means of the pin 144 to the inner face of the side wall 2 in an inclined position, is a coin and cam-actuated lever 145 having its upper end provided with a spring arm 146. The upper end of the arm 146 is adapted to pass through the slotted opening 142 of the coin-chute, as clearly shown in Fig. 5. At the lower or opposite end of said lever 145 is a dog 147 which is pivotally held thereto by means of the pin 148. This dog 147, it will be noticed is in the shape of a bell-crank having the two arms 149 and 150, the arm 150 being provided with the weighted end 151 and the arm 149 with the recess or notch 152 adapted to receive one of the outwardly projecting pins 153 secured to the plate 154. The plate 154 is rigidly secured to the shaft 155, which shaft is loosely held within the tubular element 156, which element is suitably secured to the side wall 2. The shaft 155 is further provided with an equilateral triangular cam 157 which cam is integral with an approximately semi-cylindrical cam 158 having the curved face 159 and the flat face 160. To normally hold the cam element just described, in the three different positions as shown in Figs. 5 and 6, I employ an arm 161 which is pivotally held at one end by means of a pin 162. The free end of this arm 161 is adapted to rest upon one of the faces 163 of the equilateral triangular cam 157, and is normally held in engagement with one of these faces at a time by means of the coil spring 164. The aforesaid pivotally held lever 145 is also normally held in an inclined position by means of the coil spring 165.

Loosely mounted in the tubular sleeve 166, as clearly shown in Fig. 4, is a shaft 167, which shaft is provided with an arm 168 having the curved lip 169' as clearly shown in Fig. 5. This arm 168 is normally held in a vertically disposed position by means of the coil spring 169 and is adapted to engage a stop 170. The opposite end of the shaft 167 is provided with a cross-head or handle 170 for actuating the arm 168.

Pivotally secured by means of the pin 171 to the side wall 2 adjacent the coin-chute 141 as clearly shown in Fig. 5, is a vertically disposed lever 172 to which is suitably secured a horizontally disposed arm 173 adapted to pass through the slotted opening 174 of the chute 141, as clearly shown in Figs. 4 and 5. This pivotally held lever 172 is adapted to be actuated for allowing the coin *a* to pass

through the chute 141 and into the coin compartment 9 by means of the cam-arm 140. This lever 172 is normally held in a vertical position against the stop 175 by means of the coil spring 176.

Referring to Fig. 2 of the drawings, it will be seen that I suitably secure to the shaft 42 a dial 177 and to one of the brackets or standards 40, a suitable pointer 178. The end of the shaft 42 is provided with a handle 179 which enables a party to turn the record-wheel D in the direction of the arrow shown in Fig. 2 to bring the number of the record which is desired to be played in alinement with the pointer 178. It will be observed from Fig. 3 of the drawings, that the record-wheel D can only be turned in one direction by hand indicated by the arrow 179' as the collar 48 will strike the arm 86, which arm will be stopped by the shaft 28 if attempted to be turned in the opposite direction as indicated by the arrow 180, which when the record-wheel D is turned in the direction of the arrow 179' by hand, the collar 48 will strike the back face 181 of the arm 86 throwing the same forward until the collar disengages the arm 86 when the spring 88 will then bring the arm back to its normal position, as shown causing the face 181 to engage the collar 48 as shown in dotted lines in Fig. 3. To normally hold the record-wheel D in position, I employ a lever 182 having the upper curved face 183 and the recess or notch 184 for the reception of one of the collars 48, as clearly shown in Fig. 3. This lever 182 is pivoted as at 185 and provided with the right angular arm 186 to the end of which is connected a coil spring 187 which at its opposite end is connected to a suitable bracket 188, which spring is adapted to normally hold the notched portion 184 in engagement with the collar 48 to normally hold the wheel stationary.

I inclose the top of the phonograph by means of a suitable cover E having at least one glass side so as to enable a party to see the numbers upon the dial 177.

The operation of my coin-controlled phonograph will now be described.

When it is desired to play the phonograph, I first turn the record-wheel D so that the pointer 178 will point toward the number of the record I desire to play, thereby causing the spring-held arm 86 to stand in the position as shown in Fig. 3 in dotted lines. After this has been done, I place a coin in the coin-chute 141, which coin will stop and rest upon the pivotally held lever 145 (see Fig. 5) and in order to start the motor B, I turn the handle 170 to the right which causes the curved face 169 of the arm 168 to engage the coin *a* and force the lever 145 to the position shown in dotted lines, which causes the dog 147 to turn the semi-

cylindrical cam 158 from the position shown in Fig. 5 to that shown in full lines in Fig. 6. This cam 158 forces the lever 35 downwardly causing the roller 39 to raise out of engagement with the recess 31 of the cam 30 and at the same time raising the brake lever 18 so as to cause the fabric 20 to disengage the friction-wheel 15 secured upon the governor-shaft 14. This allows the motor B to start running. In the meanwhile, the lever 145 has returned to its normal position, as shown in full lines and the roller 39 connected with the end 36 of the lever 35, is adapted to roll upon the periphery of the cam 30, and the curved face 159 of the semi-cylindrical cam 158 causes the lever 35 to hold this position as clearly shown in Fig. 6. The reproducer-supporting carriage is adapted to be carried to the left or starting point just as soon as the motor is started by means of the worm-shaft 133, and the arm 68 is held in the position shown in dotted lines in Fig. 9 caused by the cam-face 33 forcing the end 81 of the arm 80 outwardly until the cam-face 33 has passed the end 81 of the arm 80 which allows the spring 84 to bring the arm 68 into its vertical position, as clearly shown in full lines in Fig. 9, thereby causing the lug 65 to enter the opening 63 of one of the record-holders 52 for rotating the same.

As soon as the record 51 has started to rotate after the carriage has reached the starting point, the collar 94 rotatably mounted on the pin 95 secured to the lever 92 leaves the cam-face and is adapted to roll upon the periphery of the cam, thereby lowering the rear end of the lever 92 which causes the forward end to rise thereby raising the arm 98 and causing the bar 102 to lie in horizontal alinement with the rod 100 which allows the spring 189' to release the disk 131 from the worm 133 thereby allowing the threaded bar 109 to engage the threaded shaft 111 causing the pin 117 to be lowered and allowing the needle 128 to engage the record for playing the same as clearly shown in Fig. 10. As soon as the threaded bar 109 engages the threaded shaft 111, the reproducer-supporting carriage is caused to travel to the right. When the record is about three-fourths played, the spring arm 139 of the cam 130 is adapted to engage the spring lip 146 of the lever 145 pressing this end of the lever down, thereby raising the opposite end causing the dog to turn the semi-cylindrical cam 158 to the position shown in dotted lines in Fig. 6, which keeps the roller 139 from entering the recess of the cam 30 at the end of one complete revolution thereof. When the cam 30 has revolved one complete revolution, the record has been played and owing to the position that the semi-cylindrical cam 158 holds the lever 35, the roller 39 cannot

enter the recess 31 to apply the brake lever 18 to the friction-wheel 15 to stop the motor B so as the cam revolves the cam-face 33 engages the end 81 of the arm 80 causing the lever 68 to take the position shown in dotted lines in Fig. 9. As soon as the arm 68 has taken this position, the reproducer-supporting carriage starts to travel to the left or starting point, the record-wheel D at the same time being rotated by means of the arm 86 a part of a revolution sufficiently to bring the next record around to the position occupied by the record just played. As soon as the new or second record is in position, the arm 68 is brought back into its vertical position thereby causing the lug 64 to enter the openings 63 of the record-holder for rotating the same. Just after the record starts to rotate, the collar 94 rotatably mounted upon the pin 95 of the lever 92 leaves the cam-face 91 and is adapted to travel on the periphery of the cam 90 thereby raising the forward end of the lever 92 and causing the rod 102 to again lie in horizontal alinement with the rod 100, which causes the carriage block 106 to drop into the position shown in full lines in Fig. 10, thereby causing the threaded block 109 to engage the threaded rod 111 and to cause the pin 117 to disengage the arm 122 to allow the needle 128 to engage the record for playing the same. Just as soon as the threaded block 109 engages the rod 111, the reproducer-supporting frame again starts to travel to the right causing the second record to be played. Now, when the spring-held arm 139 strikes the end of the lever 145, the second time, it causes the dog 147 to bring the semi-cylindrical cam 158 back to its normal position as clearly shown in Fig. 5, and just as soon as the spring-held arm 68 is again carried into the position shown in dotted lines in Fig. 10, the roller 39 is adapted to fall into the recess 31 of the cam 30, thereby causing the fabric 20 of the brake lever 18 to fall back into its horizontal position owing to the fact that the lever 35 passes through one end thereof, thereby causing the fabric brake 20 to engage the periphery of the friction-wheel 15 secured to the governor-shaft 14 for stopping the motor B. From this description, as to the operation of this device, it will be readily seen that the phonograph will automatically play two records for a single coin.

In case a party should not turn the record-wheel D and select the record to be played before placing the coin in the coin-chute, the spring-arm 86 will bring the next record up into position while the reproducer-supporting carriage is being carried to the left or starting point so it will be readily seen that it is not necessary for a party to select the record to be played.

Referring to Figs. 4 and 5 of the draw-

ings, it will be readily seen that when the cam 138 revolves approximately one-fourth of a revolution, that the pin 140 will engage or strike the upper end of the lever 172 thereby causing the threaded end of the arm 173 upon which the coin *a* is resting, as shown in Fig. 4, thereby allowing the coin *a* to pass downwardly through the coin-chute 141 and enter the coin compartment 9.

After the coin is allowed to pass the lug 143 and pass downwardly through the coin-chute, the spring 176 will carry the arm 172 back to its normal position as clearly shown in full lines in Fig. 5.

My clock-controlled means for starting and stopping the motor B of the phonograph will now be described. This attachment may be used with or without the coin-controlled mechanism. The clock F is adapted to be set at any suitable place adjacent the brake lever 18 and the means for actuating the brake lever consists of a cam-wheel 189 having the arm or lug 190. The cam-wheel 189 is secured to the sleeve 191 upon which sleeve the minute hand of the clock is secured. This sleeve 191 is loosely mounted upon the shaft 192. Journaled within the clock-frame 193 and transversely thereof, is a shaft 194 having its end adjacent the cam 189 provided with an arm 195, which arm is rigidly secured thereto. The opposite end of the shaft 194 is provided with an arm 196 having a lower flat face or surface and is normally held in position by means of the coil spring 197. It will be observed that the spring 197 normally holds the arm 195 in contact with the stop 198. Pivottally held adjacent the arm 196 is a lever 199 having the long end 200 and the short end 201. The short end 201 is adapted to engage the under flat face of the arm 196 as clearly shown in Fig. 15 and the long end 200 thereof is adapted to engage the underside of the right angular end 202 of the brake lever 18. The clock mechanism is adapted to start the motor B of the phonograph and cause the same to run long enough to play one record each hour. It will be observed from Fig. 16 of the drawings that when the minute hand 103 is at the hour mark on the dial 104 of the clock, that the cam-arm 190 is in engagement with the arm 195 in the shaft 194. Now as the minute hand moves to the right, it moves the arm 195 thereby causing the free end of the arm 196 to move downwardly thereby causing the short end of the lever 199 to move downwardly and causing the long end to rise, thereby raising or releasing the brake lever 18 from the friction-wheel 15 mounted or secured to the governor-shaft 14. This cam-arm 195 holds the fabric 20 of the brake lever 18 out of engagement with the friction-wheel 15 the length of time required to play the record which is approximately two minutes. If it is desired to have the

motor run more than once an hour, by means of the clock mechanism, I simply provide the cam-wheel 189 with as many additional cam-arms as the number of times it is desired to run the motor.

The means for starting and stopping the motor shown in Fig. 17 is only used when it is not desired to use either the coin or clock-controlled mechanism. To accomplish my object, I employ an arm 204 pivottally held in position by the pin 205 adjacent the free or long end of the brake lever 18. The pin 205 is provided with an arm or handle 206 for engaging or disengaging the arm 204 with the brake lever 18. When the motor has stopped the arm 204 stands as shown in full lines in Fig. 17, and when the arm 204 is placed in the position shown in dotted lines, the brake lever 18 is adapted to rise to the position shown in dotted lines by means of the coil spring 207, thereby releasing the fabric 20 from engagement with the periphery of the friction-wheel 15 which allows the motor to run. By this arrangement, it will be seen that I may play all of the records or as many records carried by the record-wheel automatically in succession, or I may play one record and then turn the arm down, as shown in full lines in Fig. 17, to engage the brake lever 18 for stopping the motor.

Having described my invention what I claim as new, and desire to secure by Letters Patent, is:

1. In a device of the class described, a motor, means for starting said motor, a rotatable record carrying wheel, a plurality of record holders arranged at regular intervals on said wheel, a rotary shaft driven by said motor, a projection on said wheel adjacent each of said record holders, means carried by said shaft and adapted to engage said projections to move said wheel through a partial revolution to bring the records successively and intermittently into operative position, means for holding said wheel in position between the partial revolutions thereof, a brake for stopping said motor, a lever controlling said brake, a cam on said shaft for actuating said lever, a second cam mounted adjacent said lever and means carried by said shaft for actuating said cam whereby said lever is held out of operation during each alternate revolution of said shaft, substantially as described.

2. In a device of the class described, a motor, a rotatable wheel, a plurality of record holders projecting from one face of said wheel, a corresponding number of projections extending from the opposite side of said wheel, a rotary shaft adjacent said wheel and driven by said motor, a pivoted arm carried by said shaft and adapted to engage said projections successively to impart a partial revolution intermittently to

said wheel, and a notched spring arm adapted to engage said projections to hold said wheel in position between the partial revolutions thereof, means for manually turning said wheel in the same direction, said pivoted arm preventing reverse movement thereof, means for stopping said motor, a lever controlling said means and a cam on said shaft for actuating said lever, substantially as described.

3. In a device of the class described, a motor, means for starting said motor, a rotatable wheel, tapering record holders on said wheel adapted to carry phonographic records, a locking ring on each of said record holders, said locking ring being arranged about the outer end of the holders and between the same and the adjacent portion of the record, an annular flange on said ring adapted to engage the outer end of the record, and means for rotating said wheel intermittently a part of the revolution to cause said records to move successively in one direction, substantially as described.

4. In a device of the class described, a motor, a shaft driven by means of said motor, a rotatable wheel, a plurality of phonographic record-holders carried by said wheel, a cam secured to said shaft, means actuated by said cam for engaging one of said record-holders at a time for rotating the same, and means for disengaging said means from said record-holders.

5. In a device of the class described, a casing, a motor inclosed in said casing, a shaft adapted to be driven by means of said motor, a horizontally disposed shaft journaled on top of said casing, a circular plate secured to said shaft, a plurality of tubular record-holders rotatably carried by means of said circular plate in a horizontally disposed position, means for engaging and rotating one of said record-holders at a time, means for disengaging said means from said record-holders, a cam secured to the aforesaid first-mentioned shaft for rotating said record-holding plate a part of a revolution at each revolution of said cam.

6. In a device of the class described, a casing, a motor inclosed in said casing, a shaft adapted to be driven by means of said motor, a horizontally disposed shaft journaled on top of said casing, a circular plate secured to said shaft, a plurality of tubular record-holders rotatably carried by means of said circular plate in a horizontally disposed position, means for engaging and rotating one of said record-holders at a time, means for disengaging said means from said record-holders, a cam secured to the aforesaid first-mentioned shaft for rotating said record-holding plate a part of a revolution at each revolution of said cam, a

reproducer, a pivotally held arm carried by said reproducer and having a needle secured thereto adapted to engage the record upon the record-holder adapted to be rotated, and means for automatically disengaging said needle from the record when the same has been played.

7. In a device of the class described, a casing, a motor inclosed in said casing, a shaft adapted to be driven by means of said motor, a rotatable wheel adapted to be mounted in bearings secured to the top of said casing, a plurality of record-holders suitably carried by means of said wheel and near the edge thereof, a cam for actuating means for intermittently engaging said record-holders, means for rotating said record-holders, means for disengaging said means from said record-holders, a cam adapted to intermittently rotate said wheel in one direction a part of a revolution at each revolution thereof, and means for starting and stopping the aforesaid motor.

8. In a device of the class described, a casing, a motor inclosed in said casing, a shaft adapted to be driven by means of said motor, a rotatable wheel adapted to be mounted in bearings secured to the top of said casing, a plurality of record-holders suitably carried by means of said wheel and near the edge thereof, a cam for actuating means for intermittently engaging said record-holders, means for rotating said record-holders, means for disengaging said means from said record-holders, a cam adapted to intermittently rotate said wheel in one direction a part of a revolution at each revolution thereof, a reproducer, a movable carriage for supporting said reproducer, means for automatically engaging the needle of said reproducer with and from a phonographic record, and means for starting and stopping the aforesaid motor.

9. The combination with a phonograph, of a horizontally disposed shaft having a circular plate secured thereto, a plurality of tubular record-holders rotatably carried thereby in a horizontally disposed position near the edge thereof, a dial secured to said shaft having a number thereon for each record-holder carried by said plate, a stationary indicator, a handle secured to said shaft for turning said plate to bring any desired record in alinement with the point of said indicator, and means for normally holding said plate in a locked position.

10. The combination with a motor, a shaft adapted to be driven by said motor, a rotatable wheel, a plurality of phonographic records rotatably carried by means of said wheel, a reproducer having a pivotally held arm, and a needle secured thereto, a traveling carriage for supporting said reproducer, means for causing said carriage to travel to

the right, means for engaging said needle with one of said phonographic records, a cam on said motor shaft and means actuated by said cam for disengaging said needle from the record after the same has been played.

11. The combination with a phonographic record, a reproducer having an L-shaped arm pivotally secured thereto and provided with an arm having a needle secured to one end thereof, and means for engaging and disengaging said needle with and from the phonographic record.

12. In a device for rotating a record-holder having a plurality of openings in one end thereof, a movable arm having a forked upper end, a shaft journaled in said forked end, a circular plate secured to one end thereof, a plurality of cone-shaped lugs secured to one face of said plate, said lugs being adapted to intermittently enter the openings in said record-holder, and means for driving the aforesaid shaft for rotating said record-holder, while the lugs are held within said openings.

13. The combination with a phonographic record, a reproducer having an L-shaped needle-supporting arm pivotally connected thereto, a loosely held pin adapted to be held out of engagement with said arm, and means for causing one end of said pin to engage said arm for disengaging the needle from the phonographic record.

14. In a device of the class described, a reproducer in combination with a plurality of records, means for moving said records successively into position adjacent said reproducer, a driven shaft and means for automatically coupling said shaft to the record adjacent said reproducer, substantially as described.

15. In a device of the class described, a reproducer and a plurality of records in combination with means for moving said records successively into a position adjacent said reproducer, a driven shaft, a clutch on said shaft and means for automatically engaging said clutch with said records successively

and for disengaging the same therefrom, substantially as described. 50

16. In a device of the class described, a reproducer and a plurality of records in combination with means for moving said records successively into a position adjacent said reproducer, an arm pivotally mounted adjacent said reproducer, a driven clutch shaft and clutch carried by said arm, a motor shaft, a cam on said motor shaft and means actuated by said cam for rocking said arm and clutch, substantially as described. 55 60

17. In a device of the class described, a reproducer and a plurality of records in combination with means for moving said records successively into a position adjacent said reproducer, a driven shaft, a cam on said shaft, a pivotally mounted arm engaging said cam and means actuated by said arm for engaging and disengaging the reproducer needle and the record, substantially as described. 65

18. In a device of the class described, a rotary record-holder, ways adjacent said holder, a carriage slidably mounted on said ways, a reproducer on said carriage, a driven threaded shaft adjacent said carriage and a worm-shaft parallel therewith, intermeshing gears on said shafts, a member pivotally mounted on said carriage, means on said member for engaging said threaded shaft when said member is in one position and means on said member for engaging said worm-shaft when said member is in another position, means for rocking said member, a pivotally mounted arm on said reproducer for holding the needle, and means interposed between said arm and said member whereby the rocking of the latter to engage said worm shall actuate said arm to retract the needle, substantially as described. 70 75 80 85

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses. 90

PETER M. RAVENSKILDE.

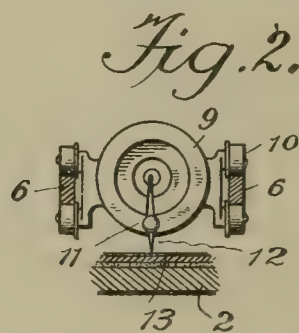
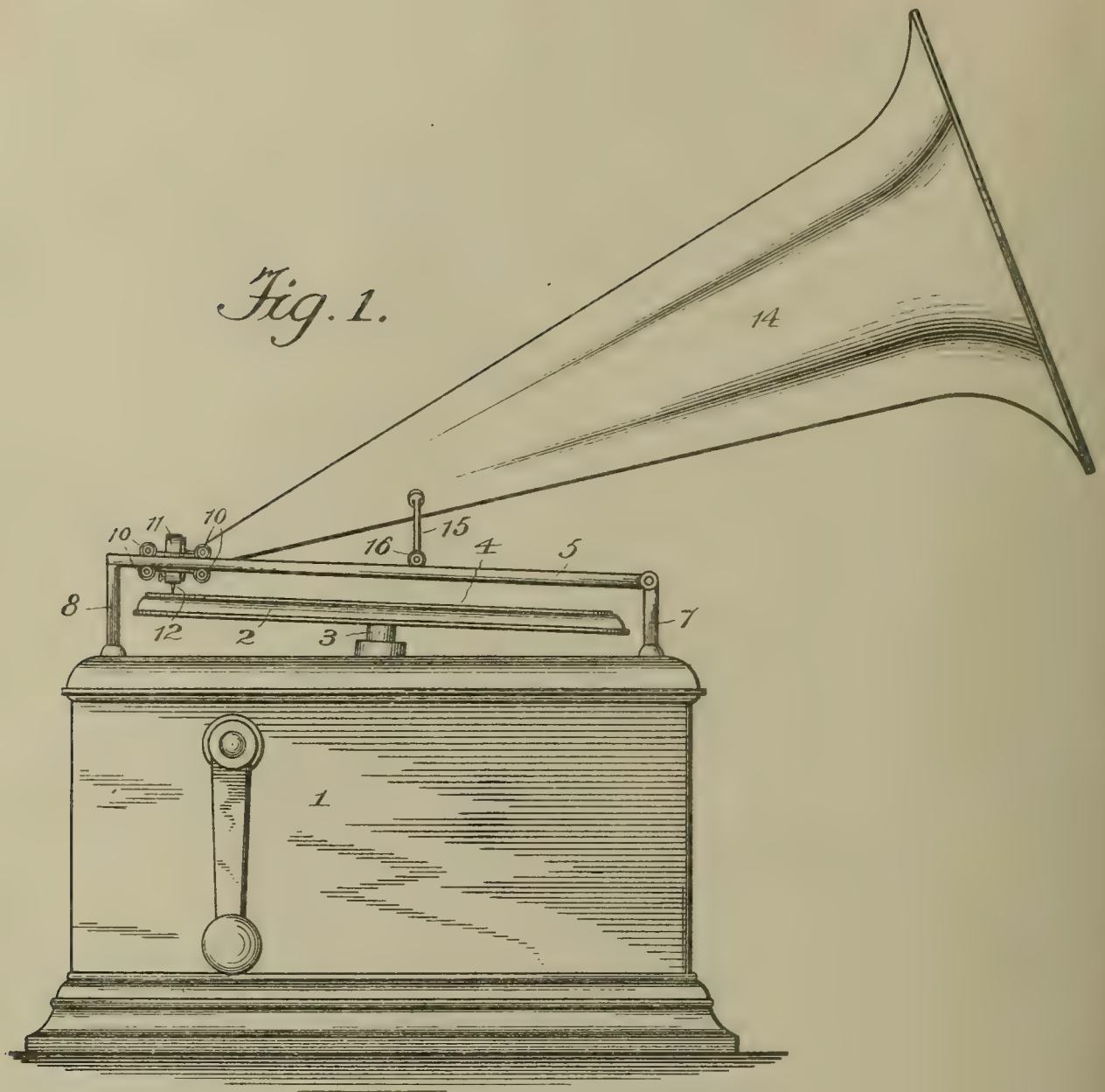
Witnesses:

P. N. WAGNER,
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 GRAPHOPHONE.
 APPLICATION FILED DEC. 16, 1907.

948,959.

Patented Feb. 8, 1910.



WITNESSES:

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INVENTOR:

Baxter Morton,

BY

Wm. Milans
 ATTORNEYS.

UNITED STATES PATENT OFFICE.

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GRAPHOPHONE.

948,959.

Specification of Letters Patent.

Patented Feb. 8, 1910.

Application filed December 16, 1907. Serial No. 406,640.

To all whom it may concern:

Be it known that I, BAXTER MORTON, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Graphophones, of which the following is a specification.

This invention relates to graphophones and has for its object the provision of a graphophone in which the reproducer is not impelled across the record tablet by means of the record groove or by mechanical feed mechanism such as a screw or rack.

In the accompanying drawings forming part of this application I have illustrated the invention as embodied in a graphophone of the disk type, the stylus of the reproducer being yieldingly propelled across the record in a plane parallel to the surface of the disk with the stylus tracking in the record groove and restrained against too rapid movement thereby.

In the drawings: Figure 1 is a view in side elevation of a complete graphophone embodying the present invention. Fig. 2 is a view partly in elevation and partly in section of the reproducer, the reproducer carriage, and a portion of the record tablet and support therefor.

Referring to the drawings by the reference characters, which designate corresponding parts in the several views, 1 designates the casing for the motor, which may be of any preferred type, and 2 designates the support for the record tablet. This support, which in the present instance is in the form of a disk, is mounted upon an axis 3 turning in suitable bearings and arranged at a very slight angle to the vertical. Arranged above the supporting disk 2 for the record tablet 4 is a guideway or track 5 for the reproducer. This guideway consists preferably of two rails 6—6 which are very slightly inclined to the horizontal and are pivoted at one end to a standard 7, the rails resting at the other end upon another standard 8, to which they may be secured in any preferred manner. The reproducer is mounted upon a small carriage 9 provided with small flanged rollers or wheels 10, preferably eight in number and arranged both above and below the rails 6 of the guideway or track. The reproducer proper, which is designated 11, is of any ordinary construction and is pro-

vided as usual with a needle or point 12 for engagement with the sound groove of the record tablet 13. A horn 14 is shown as suitably connected with the reproducer for intensifying the sound, and this horn is preferably supported in part by a bracket 15 having flanged rollers 16 resting upon the rails 6 of the guideway or track 5.

In the operation of the apparatus constructed as shown and described, the record disk is mounted on the support in the usual manner and rotation is imparted to the disk by means of the motor in the casing 1. The reproducer is brought into position at the beginning of the sound groove by raising the guideway or track 5 and sliding the carriage along the guideway or track until the proper point is reached. The needle or tracer 12 is then brought into engagement with the sound groove by lowering the guideway or track 5, and the reproduction of sound will begin when the motor is set in operation. As the reproducer carriage tends to move along the guideway or track 5 from a high point to a lower one, no mechanical means is necessary to impart movement to the reproducer; but the rate of travel of the reproducer along the guideway or track is determined by the sound groove of the record tablet, which restrains such travel through the engagement of the needle or tracer 12 therewith. As the inclination of the guideway or track is very slight, the component of the force of gravity tending to produce movement of the reproducer carriage along the guideway or track is not sufficient to cause the needle or tracer 12 to press very forcibly against the side of the sound groove on the record tablet, and therefore pressure of the needle or tracer against the side of the sound groove will not interfere materially with the freedom of vibration of the reproducer diaphragm. As the record disk rotates on the support 2 the reproducer carriage will gravitate toward the lower end of the guideway or track as fast as the rotation of the record disk will permit, the advance of the reproducer carriage with each rotation of the disk being equal to the distance between adjacent whirls of the spiral sound groove on the disk.

While I have shown the record disk lying in an inclined plane and as mounted on a

support having an inclined axis. I do not limit myself to this construction, as it will be obvious that the reproducer carriage may travel upon an inclined guideway or be so supported that its path will lie in an inclined plane without its being necessary to have the axis of rotation of the record disk correspondingly inclined. On the contrary, the axis of the support for the record disk may be vertical and the disk itself may lie in a horizontal plane, if the reproducer needle or tracer is so mounted that it can follow the groove in which the reproducer needle is carried by a pivoted arm so that the carriage need not remain at a fixed distance from the record disk. Furthermore, any other support which will cause the reproducer carriage or reproducer itself to travel in an inclined plane under the influence of gravity may be employed as a support for the reproducer or reproducer carriage in lieu of the guideway or track 5. The guideway or track has been described and illustrated as a simple and satisfactory support which has some advantages over the swinging arm pivoted on a laterally projecting bracket mounted on the motor casing which is commonly employed with graphophones of the disk type.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a talking machine, the combination of a sound record, movable reproducing mechanism, and inclined supporting and guiding devices for supporting said mechanism and guiding it in its movement in coaction with the sound-record, the inclination of said devices causing said mechanism to travel across the record and in an inclined plane under the influence of gravity, with the stylus of the reproducing mechanism tracking in and restrained by the record-groove throughout the several convolutions thereof, substantially as set forth.

2. In a talking machine, the combination of a rotatable turn-table for supporting a disk record lying in a plane slightly inclined to the horizontal, means for rotating the turntable on an axis perpendicular to said plane, reproducing mechanism, and inclined supporting and guiding devices for supporting said mechanism and guiding it in its movement in coaction with the record, the

inclination of said devices causing said mechanism to move in a plane parallel with the face of the turntable with the stylus thereof tracking in and restrained by the record groove throughout the several convolutions thereof, substantially as set forth.

3. In a talking machine, the combination of a motor-box adapted to rest upon the support with the base thereof horizontally disposed, a rotatable turn-table for supporting a disk record mounted on said box and lying in a plane slightly inclined to the horizontal, means for rotating the turn-table on an axis perpendicular to said plane, a disk sound record on said turntable and movable reproducing mechanism mounted in position for the stylus thereof to coact with the record-groove in the disk on the turn-table, said reproducing mechanism being adapted to be actuated by gravity to move across the record during the reproduction of the record, substantially as set forth.

4. In a talking machine, the combination of a motor-box adapted to rest upon a support with the base of said box horizontally disposed, a rotary shaft mounted in said box, the axis of which shaft extends at an angle to the plane of said base, a rotatable turntable for supporting a disk record mounted on said shaft and lying in a plane inclined to the horizontal, a disk sound-record on the turntable, and reproducing mechanism mounted adjacent to the turntable for movement under the influence of gravity in an inclined plane so that the stylus thereof may coact with the record-groove in the disk on the turntable throughout the several convolutions of said groove, substantially as set forth.

5. In a mounting for sound reproducing machines having a record and a sound reproducing head, means for feeding the sound head transversely across the path of the record by gravity comprising an inclined rail inclined to the base of said machine and means traveling upon said rail for carrying said sound reproducing head.

This specification signed and witnessed this 12th day of December, 1907.

BAXTER MORTON.

Witnesses:

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J. H. MOUNT.
TALKING MACHINE.
APPLICATION FILED MAY 9, 1908.

949,939.

Patented Feb. 22, 1910.

6 SHEETS—SHEET 1.

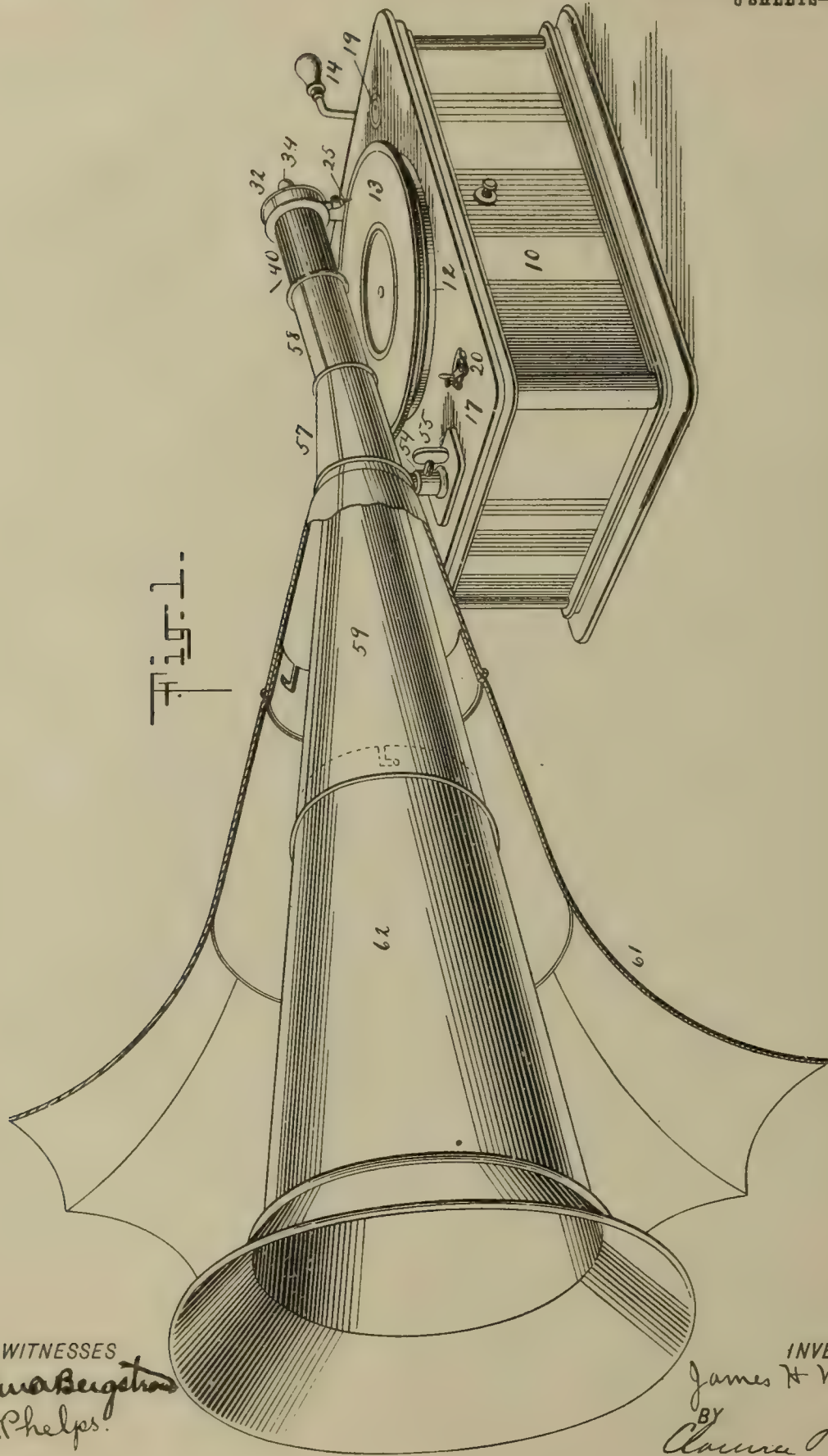
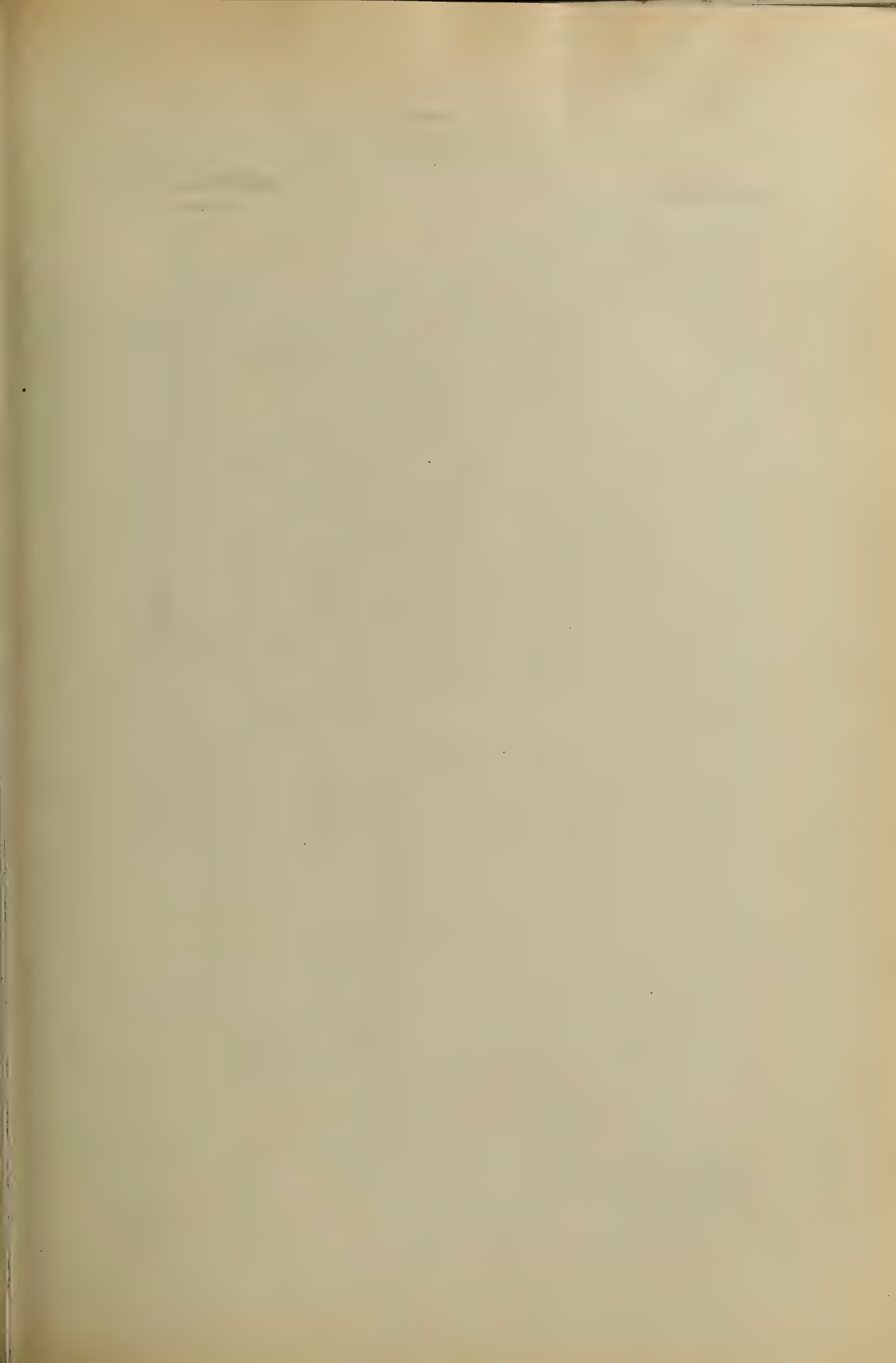


Fig. 1.

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5 SHEETS—SHEET 2.

949,939.

Fig. 14.

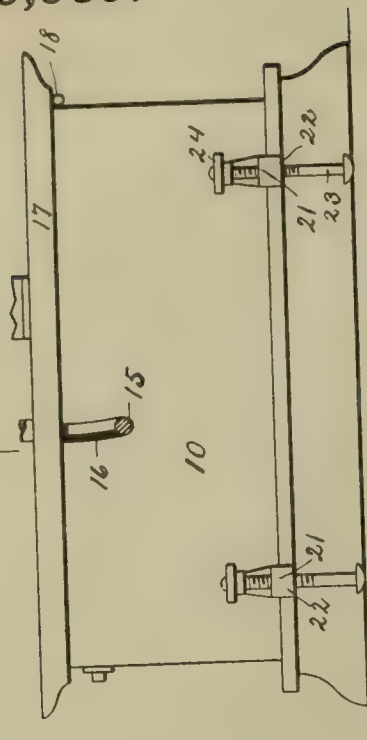
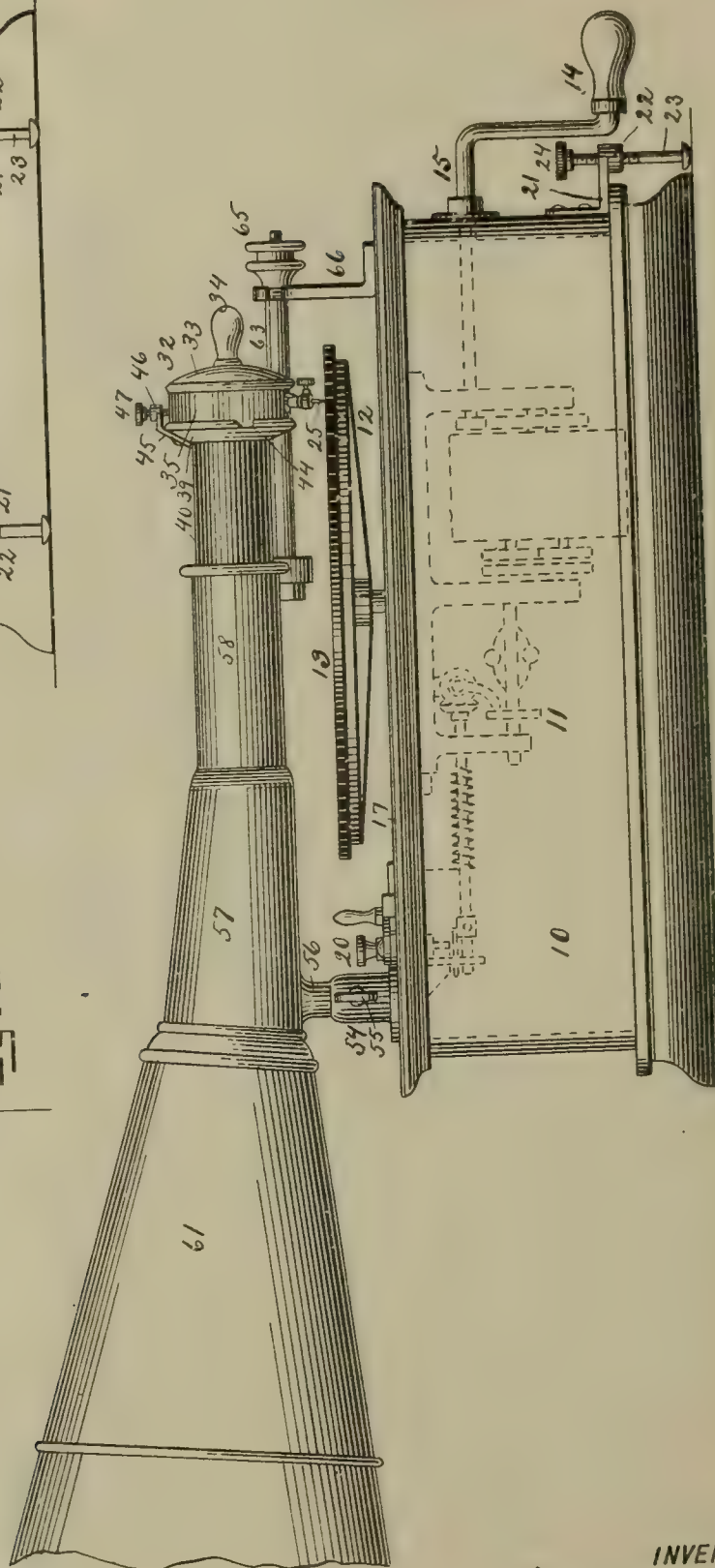


Fig. 2.



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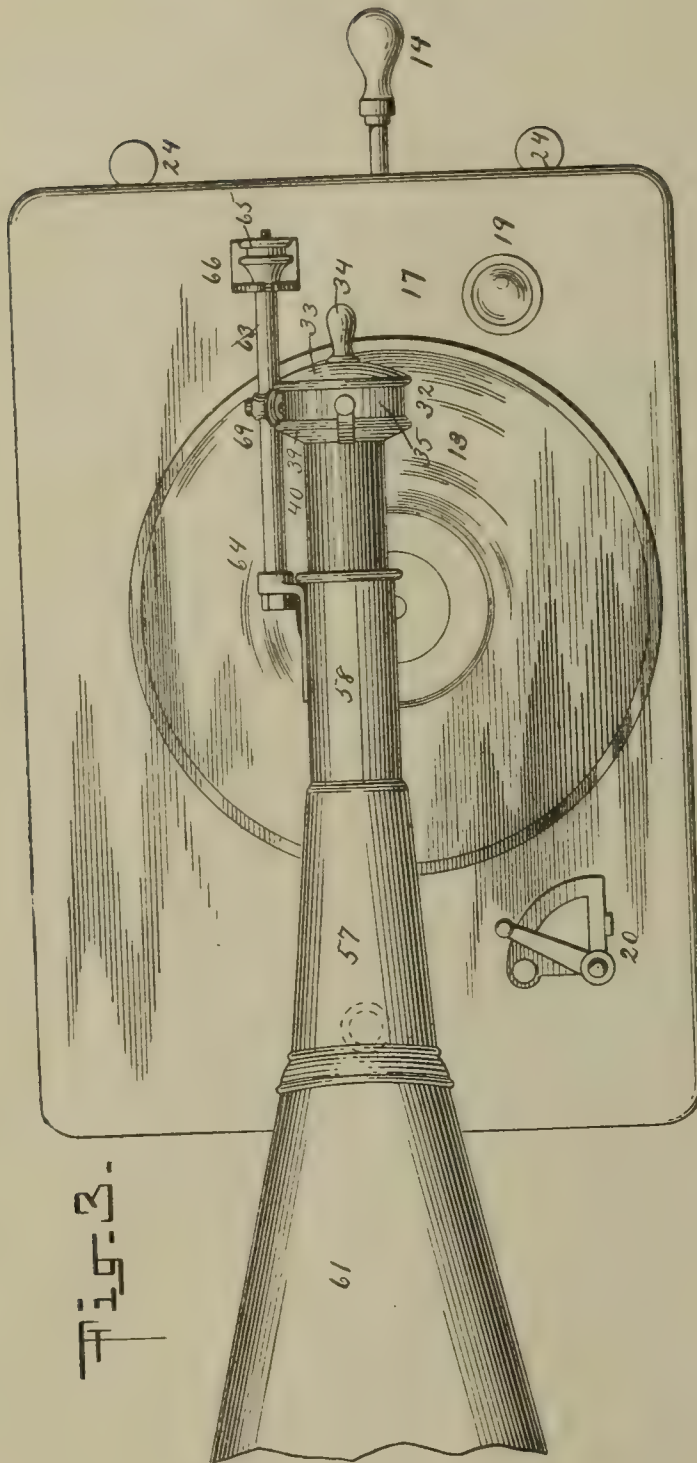


Fig. 3.

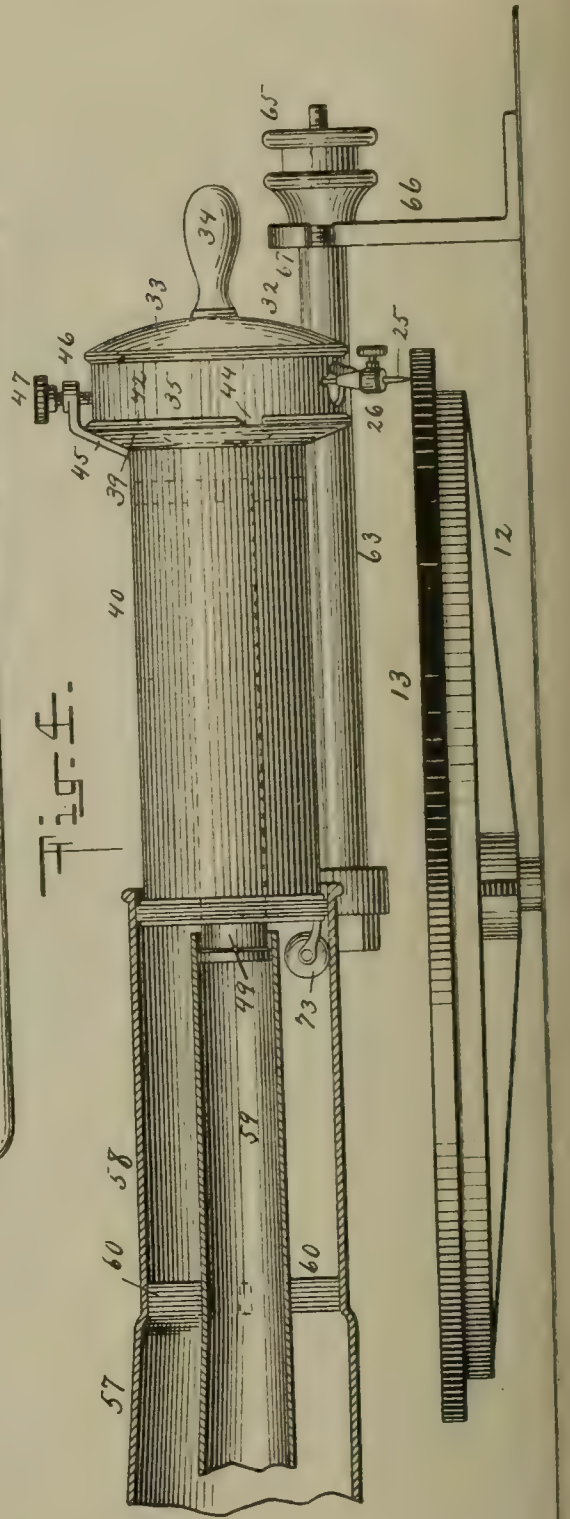


Fig. 4.

WITNESSES
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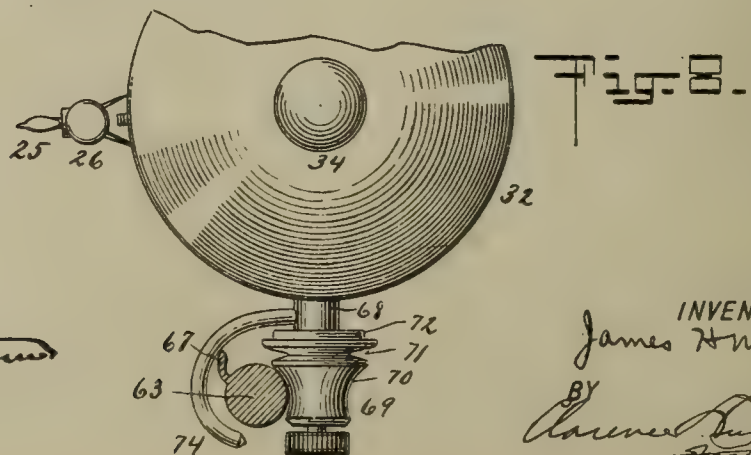
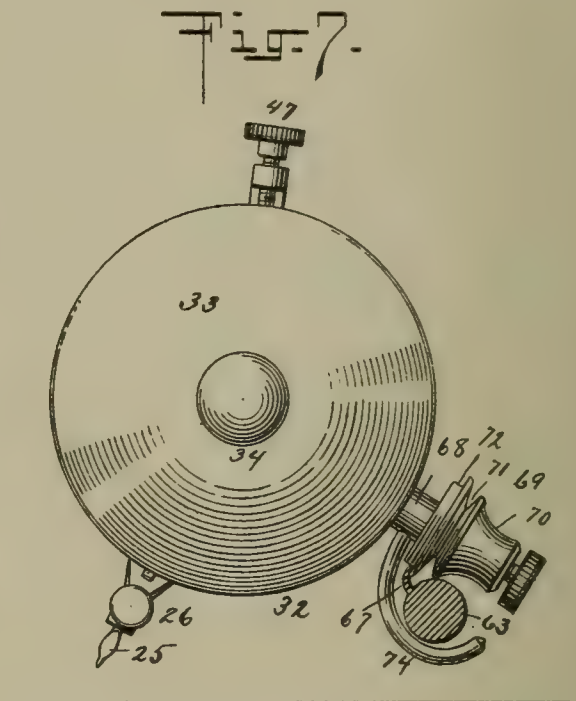
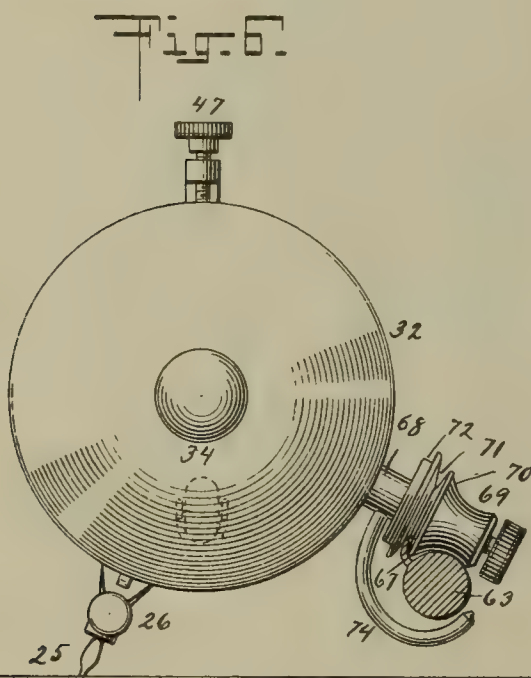
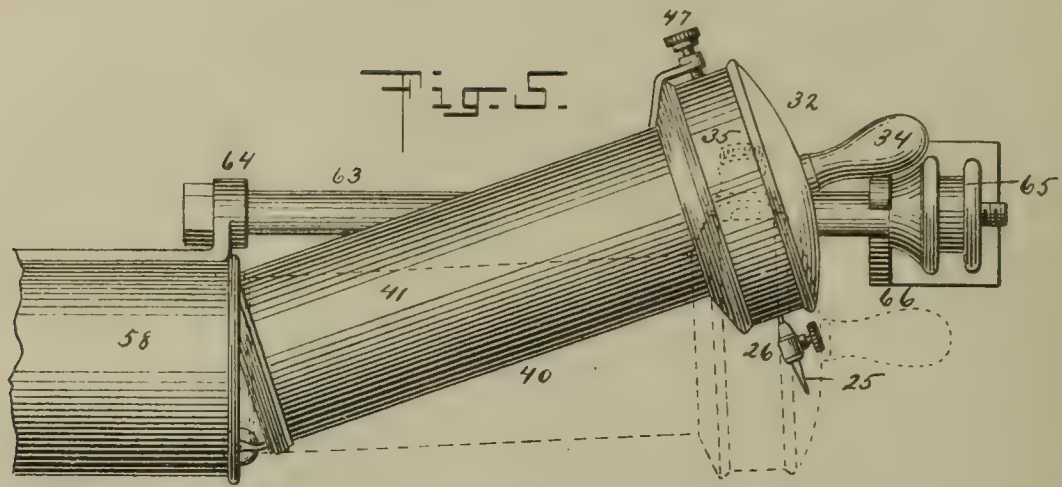
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TALKING MACHINE.
APPLICATION FILED MAY 9, 1908.

949,939.

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6 SHEETS—SHEET 4.



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TALKING MACHINE.
APPLICATION FILED MAY 9, 1908.

Patented Feb. 22, 1910.

6 SHEETS—SHEET 5.

949,939.

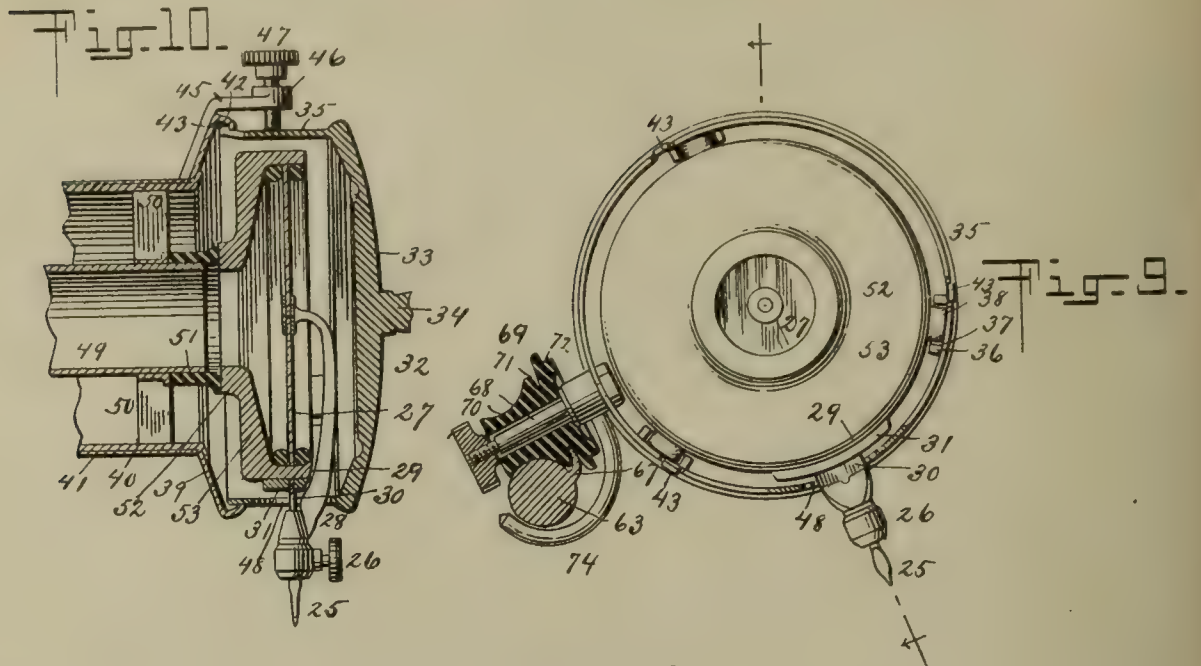


Fig. 11.

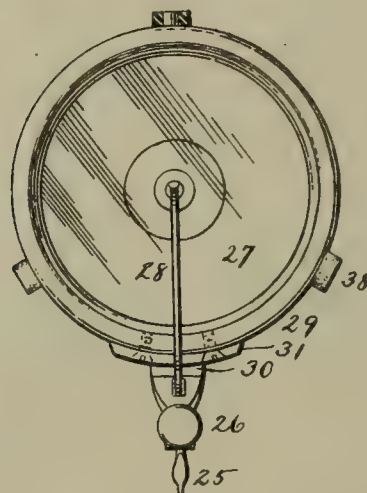


Fig. 12.

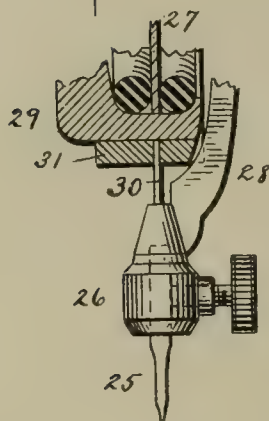
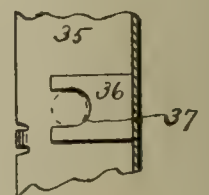


Fig. 13.



WITNESSES
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UNITED STATES PATENT OFFICE.

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TALKING-MACHINE.

949,939.

Specification of Letters Patent.

Patented Feb. 22, 1910.

Application filed May 9, 1908. Serial No. 431,819.

To all whom it may concern:

Be it known that I, JAMES H. MOUNT, a citizen of the United States, residing in Jamesburg, in the State of New Jersey, have
5 invented a new and useful Improvement in Talking-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to talking machines, particularly those of the disk-record type, but some of my improvements are also applicable to talking machines of the cylinder-record type.

One object of my invention is conveniently to provide for taking the machine apart and putting it together to facilitate packing and transportation.

Another object of my invention is to simplify, strengthen and improve the attachment of the stylus to the diaphragm holder.

Another object of my invention is to provide for conveying the vibrations through the sound box from both sides of the diaphragm so that the sound will be amplified and made more powerful and more distinct.

Another object of my invention is to provide for conveying the vibrations from opposite sides of the diaphragm through concentric tubes so that the vibrations from the front of the diaphragm will so merge with the vibrations from the back of the diaphragm as to produce a large volume of tone of great distinctness, power and melody.

Another object of my invention is conveniently to provide for removing the sound box from the record for replacing the needle or substituting the record.

Another object of my invention is so to counterbalance the sound box and accommodate its motion over the record that the grinding noise peculiar to most talking machines will be further obviated.

Another object of my invention is so to support the sound box on the cabinet that the whole machine can be jarred or moved without disturbing the sound or scratching the record.

Other objects of my invention will be set forth hereafter in the description.

To these various ends, my invention comprises various novel features of construction and combination of parts as are hereinafter pointed out in the claims.

In order that my invention may be fully understood, I shall, prior to claiming the same, describe in detail a talking machine

embodying the various features of my invention.

Reference is to be had to the accompanying drawings forming part of this specification in which like numbers indicate corresponding parts in all the figures.

Figure 1 is a perspective view of a talking machine of the disk-record type embodying my invention, a part being in section. Fig. 2 is a side elevation of the same. Fig. 3 is a plan view of the same. Fig. 4 is an enlarged side elevation of the same, parts being in section and the cabinet removed. Fig. 5 is a detail view showing the sound box and stylus in full lines swung aside for replacing the stylus and, in dotted lines, raised for introducing the record. Fig. 6 is an end view of the sound box showing the stylus resting on the record. Fig. 7 is a similar view showing the stylus and sound box partly raised for introducing the record. Fig. 8 is a similar view showing the sound box and stylus fully raised for replacing the needle. Fig. 9 is an end view of the sound box and attachments with its cover removed so as to disclose its interior. Fig. 10 is a sectional view of the sound box and attachments. Fig. 11 is a detail view showing the diaphragm and attachments removed from the sound box. Fig. 12 is an enlarged detail view showing the stylus clamp and its attachments to the diaphragm holder. Fig. 13 is a detail view showing the method of supporting the diaphragm holder in the sound box. Fig. 14 is an end elevation of the cabinet showing the device for adjusting the inclination of the record and the means for opening the cabinet without removing the winding handle.

In the drawing, 10 designates the cabinet of a talking machine which contains the mechanism, 11, indicated in dotted lines in Fig. 2 for rotating the turntable, 12, and thereby rotating the record, 13, which is here represented as of the ordinary disk type.

14 designates the winding handle of the actuating mechanism, 11, which I prefer to fasten permanently to the winding shaft, 15, and arrange to drop into and be raised out of a curved slot, 16, shown in Fig. 14, in the end wall of the cabinet, 10, so that the mechanism, 11, being fastened to the cover, 17, of the cabinet, 10, when said cover is raised on its hinge, 18, convenient access may be had to the actuating mechanism without removing the winding handle, 14.

In order that the timing device, 19, on the top of the cabinet and the starting and stopping device, 20, also on the top of the cabinet, may be manipulated by both hands simultaneously, I arrange the timing device as shown in Fig. 1 on the right hand side of the cabinet and the stopping and starting device, 20, on the left hand side of the cabinet, connecting the stopping and starting device by suitable gearing with the actuating mechanism, 11, as indicated in Fig. 2.

The stylus and sound box in my invention is arranged as hereinafter described to travel radially from the periphery of the record, 13, to the center of the same and in order to aid said motion produced by the pressure of the side of the record groove against the stylus, I provide means for raising the outside end of the cabinet and thereby inclining the record downward in the direction of travel of the stylus so that the motion of the stylus toward the center of the record will be aided by gravity, the pressure of the side of the groove against the stylus will be minimized and the grinding noise thereby produced peculiar to most talking machines will be entirely obviated. As convenient means for thus raising the outer end of the cabinet, I have here shown brackets, 21, attached to the end of the cabinet and carrying threaded nuts, 22, through which are screwed correspondingly threaded legs or standards, 23, having heads, 24, by which they may be turned to elevate that end of the cabinet and therefore incline the record as much as may be desirable. The stylus, 25, is inserted in the clamp, 26, in the usual way and such clamp is connected to the diaphragm, 27, by a sound conveying bar, 28, of the ordinary description. I attach the stylus clamp, 26, however, to the diaphragm ring, 29, by means of a thin spring plate, 30, secured in the plane of the diaphragm to a plate, 31, rigidly attached to the ring, 29, so that the stylus and its clamp can play with the vibrations imparted to it through the bar, 28, by the diaphragm, 27, on said spring plate, 30, to and fro in the direction of the axis of the diaphragm but not transversely to said axis. By this arrangement, the vibrations of the stylus are more accurately transmitted to the diaphragm, 27, and a perfect reproduction of the original sound is made.

The sound box, 32, consists of a closed head, 33, having a handle, 34, and a cylindrical wall, 35, formed integrally with the head, 33. On the inside of the wall, 35, of the sound box are fixed blocks, 36, having axially slotted seats, 37, opening inwardly to receive cushioned studs, 38, projecting radially from the periphery of the diaphragm ring, 29, so that when the diaphragm ring is in place, the diaphragm and its ring will be separated by an air space from the head,

33, of the sound box, and also from the wall, 35, of said sound box, as best indicated in Fig. 10. The wall, 35, of the sound box is joined detachably to an annular ring, 39, secured to the outer end of a tube, 40, which is covered with cloth or other non-vibratory material, 41, as best indicated in Fig. 10.

The detachable union of the sound box to the ring, 39, preferably consists of the inturned flange, 42, on the ring, 39, to receive the end of the wall, 35, which has lugs, 43, to pass through the slot, 44, in said flange, 42, so that the sound box can be disengaged from the ring, 39, by rotating it so as to bring one lug, 43, opposite the slot, 44, when the sound box can be easily removed. To make the attachment of the sound box to the ring, 39, and tube, 40, more secure, I fasten a bracket, 45, on the ring, 39, carrying a nut, 46, through which a set screw, 47, is arranged to screw against the wall, 35. With this arrangement, by detaching the sound box, 32, from the ring, 39, the diaphragm ring, 29, and with it the diaphragm and stylus can be removed from the open side of the sound box, the stylus and its clamp being withdrawn through a slot, 48, in the wall of the sound box. Within the tube, 40, I fasten concentrically so as to leave an air space between them, an inner tube, 49, by radial spacing pieces, 50, so that the axis of the tube, 49, will be directly in line with the diaphragm, 27. Around the inner end of the tube, 49, I preferably place a non-vibratory bushing, 51, against the end of which is arranged to abut the collar, 52, formed around an annular flange, 53, projecting inwardly from the diaphragm ring, 29. By this construction, as will be best seen in Fig. 10, the vibrations from the front of the diaphragm, 27, will be transmitted directly through the collar, 52, and the inner tube, 49, while the vibrations from the rear of the diaphragm, 27, will be transmitted through the space between said diaphragm and head of the sound box, through the annular space between the ring, 29, and the wall, 35, of said sound box, through the space between the flange, 53, and the annular ring, 39, and thereby through the annular space between the tube, 40, and the concentric inner tube, 49, fixed therein.

On the top of the cabinet, 10, I fix a vertical socket, 54, provided with a set screw, 55, in which is clamped detachably a standard, 56, fixed on an outer sound tube, 57. The sound tube, 57, is provided with a cylindrical extension, 58, axially in line with the diaphragm, 27, and sound tubes, 40 and 49, and in this extension, 58, of the sound tube, 57, the tube, 40, is arranged to travel axially, carrying with it the sound box and stylus, by means of a roller, 73, fastened to the end of the tube, 40, and running on the interior of the sound tube, 58. Within the sound

tube, 57 and 58, is also fixed concentrically an inner sound tube, 59, by radial spacing pieces, 60, and in said inner tube, 59, the inner tube, 49, is likewise adapted to travel
 5 axially and freely, supported by the same roller, 73. The direct and reflected vibrations from the diaphragm, 27, will therefore be conveyed through the sound tubes, 59 and 58 respectively in all positions of the
 10 sound box as the same travels over the record, 13.

On the outer end of the outer sound tube, 57, is fastened by means of an ordinary bayonet lock an amplifying horn, 61, and on the
 15 outer end of the inner sound tube, 59, is fastened by means of an ordinary bayonet lock, concentrically within the outer horn, 61, but projecting beyond the same, an inner amplifying horn, 62. The direct vibrations
 20 from the diaphragm, 27, will therefore emerge from the inner horn, 62, and the reflected vibrations from the diaphragm, 27, will emerge from the outer horn, 61. The adjustment and arrangement of the two
 25 horns is such that the sounds emerging therefrom will mingle so as to produce a melodious whole of peculiarly clear, distinct and amplified character.

To guide and support the sound box and
 30 the inner ends of the cylinder, 40, and inner tube, 49, while traveling radially across the record and at the same time permit the sound box to be raised from the record for replacing the record on the stylus, I fasten a rail,
 35 63, on top of the cabinet parallel with the axis of the motion of the sound box. One end of the rail, 63, is fastened detachably in a bracket, 64, attached to the end of the outer sound tube, 58, and the other end of
 40 the rail, 63, is fastened detachably by means of a set screw, 65, in a slotted standard, 66, erected on the top of the cabinet, 10. The rail, 63, is formed with an upwardly curved flange, 67, running along its upper and inner
 45 side. On the side of the sound box, 32, is secured a short axle, 68, on which is mounted to rotate freely an antifriction roller, 69, having a concave face, 70, to run on the rail, 63, an annular groove, 71, to engage and run
 50 on the flange, 67 and an annular shoulder, 72, also to engage the flange, 67, as best shown in Figs. 6, 7, and 8. With this construction when the stylus, 25, is traveling across the record, the concave face, 70, of the
 55 roller, 69, runs along the rail, 63, and the groove, 71, on the flange, 67, as best shown in Fig. 6, so that the sound box and its attachments, while traveling across the record is supported by the stylus, 25, the rail, 63,
 60 and the roller, 73. A large part of the weight of the sound tube and attachments is therefore taken off the stylus which bears upon the record with just sufficient weight to receive the vibrations thereof and the grinding
 65 noise peculiar to most talking machines

is entirely done away with. When it is desired to replace the record, the sound box is withdrawn to the end of the rail, 63, by means of its handle, 34, so that the ends of
 the outer tube, 40, and inner tube, 49, will be
 70 freed from the sound tubes, 58 and 59, as indicated in Fig. 5. The sound box is then raised until the flange, 67, on the rail, 63 is disengaged from the groove, 71, on the roller,
 69, and the shoulder, 72, is rested on the
 75 flange, 67, as shown in Fig. 7. The stylus is thus held above the record so that the same can be removed and replaced at will. On the shaft, 68, of the roller, 69, is fixed a hook, 74, curving around the under side of
 80 the rail, 63, which keeps the roller, 69, from being thrown off the rail, 63, as indicated in Figs. 6, 7 and 8. When it is desired to replace the stylus, the sound box is raised still
 85 farther above the record, as indicated in Fig. 5, until the groove, 71, and shoulder, 72, are completely disengaged from the flange, 67, and the hook, 74, engages the rail, 63, and supports the sound box in its uppermost position, as indicated in Fig. 8. The
 90 stylus may then be removed and replaced at will. Conversely to replace the stylus on the record, the sound box is swung over on the record until the roller, 69, and groove,
 71, engage the rail, 63, and flange, 67, as previously described and shown in Fig. 6.

By the arrangement thus described, the sound tubes and horns are firmly secured to the cabinet and the sound box and attachments securely confined within their limit of
 100 motion, so that the whole machine can be jarred or moved without disturbing its action and without scratching the record even when the stylus is shifted across its face.

It is evident that the concentric sound
 105 tubes and horns herein described may also be applied to the ordinary phonograph in which the stylus swings on a pivoted elbow, but I prefer the axial motion of the diaphragm with respect to the sound tubes as
 110 giving a very much clearer and better production of the sounds impressed on the record.

It is evident that the reproducing mechanism herein described may be used with a
 115 cylinder record as well as with the disk record shown. It is also evident that a common spirit level may be employed on top of the cabinet to show the inclination of the cabinet and thus of the record when the same
 120 is adjusted as herein described to cause the motion of the stylus to be aided by gravity.

Having thus described my invention and the mode in which I carry the same into
 125 practice, I claim as new and desire to secure by Letters Patent,

1. In a talking machine, the combination, with the record and its actuating mechanism, of a sound box carrying the reproducing mechanism, a traveling sound tube at
 130

attached to the sound box, and carrying a roller, a fixed sound tube within which the traveling sound tube moves telescopically, its roller running along the interior of the fixed sound tube, a roller on the sound box and a rail on which the latter roller runs, so that the said sound box and its attached tube are carried by the two rollers and the stylus in a straight line across the record.

2. In a talking machine, the combination, with the record and its actuating mechanism, of a sound box carrying the reproducing mechanism, a traveling sound tube attached to the sound box, a fixed sound tube along which the traveling sound tube travels telescopically, a roller carried by the sound box, a rail along which said roller runs to guide the sound box across the record, and a flange along said rail to engage the roller and hold the sound box in an elevated position for replacing the record.

3. In a talking machine, the combination, with the record and its actuating mechanism, of a sound box carrying the reproducing mechanism, a traveling sound tube attached to the sound box, a fixed sound tube along which the traveling sound tube moves telescopically, a roller carried by the sound box having an annular groove, a rail on which said roller runs and a flange along said rail to engage the annular groove on the roller.

4. In a talking machine, the combination, with the record and its actuating mechanism, of a sound box carrying the reproducing mechanism, a traveling sound tube attached to the sound box, a fixed sound tube along which the traveling sound tube moves telescopically, a roller carried by said sound box and having an annular shoulder, a rail on which said roller runs, and a flange on said rail to engage said shoulder on the roller and support the sound box in an elevated position for replacing the record.

5. In a talking machine, the combination, with the record and its actuating mechanism, of a sound box carrying the reproducing mechanism, a traveling sound tube attached to the sound box, a fixed sound tube along which the traveling sound tube moves telescopically, a roller carried by the sound box having an annular groove and an annular shoulder, and a rail having a flange on which said roller runs with its groove engaging said flange, the sound box to be raised until the shoulder on said roller engages the flange on said rail so as to hold the sound box in an elevated position for replacing the record.

6. In a talking machine, the combination, with the record and its actuating mechanism, of a sound box carrying the reproducing mechanism, a traveling sound tube attached to said sound box, a fixed sound tube along which the traveling sound tube moves telescopically, a roller carried by the sound box,

a rail on which said roller runs, and a hook-like projection carried by the sound box to extend under said rail and engage and hold the sound box when swung over the rail to replace the stylus.

7. In a talking machine, the combination, with the cabinet holding the record and its actuating mechanism, of a fixed sound tube, a socket, standard and set screw for securing the said sound tube to the cabinet, a sound box and attached sound tube traveling telescopically along said fixed sound tube, a roller carried by said sound box, a bracket on said fixed sound tube, a standard on the cabinet and a rail on which said roller runs connecting the bracket on the fixed sound tube with the standard on the cabinet and serving rigidly to hold the fixed sound tube as well as itself in place.

8. In a talking machine, the combination, with the record and its actuating mechanism, of a stylus, a sound box and a diaphragm fixed thereon, so as to leave an opening in front of the diaphragm and an open space behind and around the diaphragm, an outer sound tube communicating with the space around the diaphragm for conveying the reflected vibrations from behind the diaphragm, an inner sound tube communicating with the opening in front of the diaphragm so as to convey the vibrations directly therefrom, and means for guiding the sound box across the record.

9. In a talking machine, the combination, with the record and its actuating mechanism, of a stylus, a sound box and a diaphragm fixed therein, so as to leave an opening in front of and a space behind and around the diaphragm, and concentric sound tubes communicating with the opening in front of the diaphragm and with the space around the diaphragm respectively, concentric amplifying horns, communicating with the inner and outer sound tubes respectively, and means for guiding the sound box across the record.

10. In a talking machine, the combination, with the record and its actuating mechanism, of a stylus, a sound box and a diaphragm fixed therein so as to leave openings in front of, behind and around the diaphragm, concentric traveling sound tubes fixed to the sound box axially in line with the center of the diaphragm and communicating with the openings in front of and around the diaphragm respectively, and fixed concentric sound tubes along which respectively the concentric traveling sound tubes move telescopically with the sound box.

11. In a talking machine, the combination, with the record and its actuating mechanism, and the fixed concentric sound tubes, of concentric sound tubes traveling telescopically along the fixed concentric sound

tubes respectively, a sound box having its cylindrical wall joined to the outer traveling sound tube, a diaphragm ring fixed within the sound box and connected to the inner traveling sound tube, a diaphragm in said ring, and a stylus connected to said diaphragm.

12. In a talking machine of the character described, the combination, with the outer traveling sound tube, having an annular ring and flange on the end thereof, of the sound box having its cylindrical wall joined detachably to said ring and flange, substantially as described.

13. In a talking machine of the character described, the combination, with the sound box having the axially slotted rests on the interior thereof, of the diaphragm ring having the radial studs to fit detachably in said rests and leave a space behind the diaphragm

and between the diaphragm ring and wall of the sound box.

14. In a talking machine, the combination, with the record and its actuating mechanism, the sound box carrying the diaphragm ring and diaphragm therein, and means for guiding the sound box across the record, of a thin spring plate fixed to the periphery of the diaphragm ring in a plane substantially parallel to that of the diaphragm, a stylus clamp fixed to said spring plate, and a vibration-transmitting connection between the diaphragm and the stylus clamp.

In testimony whereof I have hereunto set my hand April 1908.

JAMES H. MOUNT.

In presence of—

GUY J. AGRATI,

CLARENCE L. BURGER.

C. THOMA, JR. & W. THOMA.
SOUND REPRODUCER OR RECORDER.
APPLICATION FILED MAY 7, 1908.

949,991.

Patented Feb. 22, 1910.

Fig- 1 -

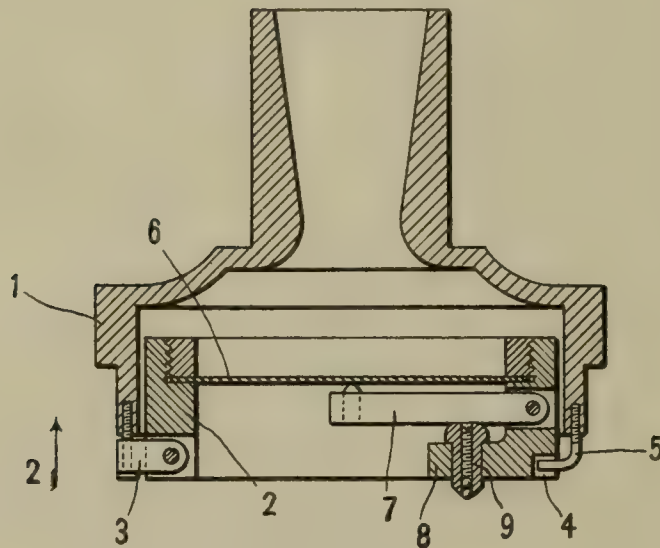


Fig- 2 -

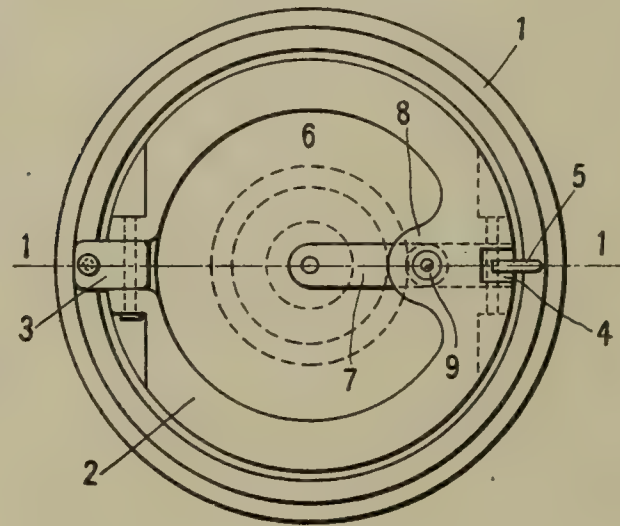


Fig- 3 -

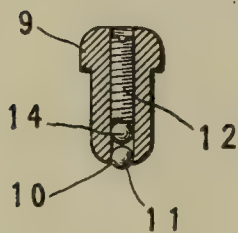


Fig- 5 -

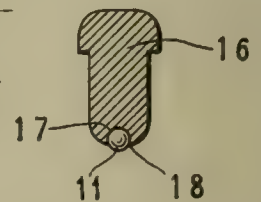


Fig- 4 -

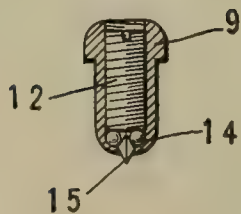


Fig- 7 -



Fig- 8 -

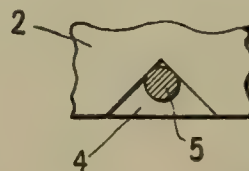
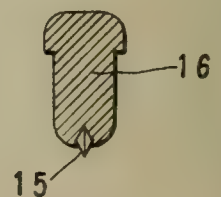


Fig- 6 -



WITNESSES:
J. Clyde Kipley.
Emma F. Pross.

INVENTORS.
Charles Thoma, Jr., and
Walter Thoma.
BY
Brook Beeken Smith
ATTORNEYS

UNITED STATES PATENT OFFICE.

CHARLES THOMA, JR., AND WALTER THOMA, OF CARLSTADT, NEW JERSEY.

SOUND REPRODUCER OR RECORDER.

949,991.

Specification of Letters Patent.

Patented Feb. 22, 1910.

Application filed May 7, 1908. Serial No. 431,416.

To all whom it may concern:

Be it known that we, CHARLES THOMA, Jr., and WALTER THOMA, citizens of the United States, and residents of Carlstadt, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Sound Reproduc-
ers or Recorders, of which the following is a specification.

The present invention relates to sound reproducers or recorders for phonographs, and has for its object, in general, to simplify structures of this kind, to increase their efficiency, and to reduce the cost of manufacture.

One feature of the invention resides in a stylus supporting member having a socket whose mouth is provided with a restricted portion, the stylus being seated in said socket and held in place by the restricted portion aforesaid. This restricted portion may take the form of a plurality of prongs, or, as shown in the drawings, it may be a continuous flange. Preferably the socket is obtained by making the supporting member in the form of a tube whose mouth is restricted and in which there is seated a follower. Between the restricted portion and the follower the stylus is interposed. The stylus is held against longitudinal axial movement in the holder, so as to vibrate in unison with such holder. So far as certain features of the invention are concerned the stylus may be of any shape found useful; but preferably it is provided with a circular contact surface concentric with the center of the stylus. Thus for cylinder machines the stylus will preferably be spherically shaped, and for disk machines the stylus will be in the form of a knife-edge disk. In the preferred embodiment of the invention the stylus will be mounted for rotation around its own axis. This may be effected by any suitable means, but preferably by the socket construction of stylus supporting member above described. By making the stylus rotatable friction is greatly reduced and admits, if desired, of the use of a cheap material as steel in place of precious stones. Furthermore, by the employment of a rotatable stylus a less harsh and more perfect tone can be produced. A non-rotatable stylus has a scraping action as it travels over the record and reproduces not only the recorded sound waves but also minute record-

ed imperfections. These recorded imperfections are so minute that the stylus, if rotatably mounted, will roll over them without being sensibly affected by them. Moreover, by using a rotatable stylus, when recording, these minute imperfections will not be recorded, and hence will not be reproduced.

In the art, as practiced at the present time, the impulse transmitting means between the stylus supporting member and the diaphragm is secured to the diaphragm and exerts a positive pull and push in both directions on the latter. One feature of this invention resides in having the impulse transmitting means disconnected from the diaphragm, and adapted to have an intermittent vibratory contact with the said diaphragm. By this means the impulse transmitting means will flex the diaphragm in one direction only, the diaphragm returning by its own weight or flexibility. This has the effect of producing a more rounded and mellow tone.

In the preferred embodiment, the stylus supporting member is seated in a guide in which it reciprocates in a rectilinear path, and has vibratory contact with the impulse transmitting means. The impulse transmitting means, in the present instance, is in the form of a pivoted lever disconnected both from the stylus supporting member and diaphragm.

The general arrangement of the parts constitutes in itself a new and useful invention. In this general arrangement, the diaphragm, impulse transmitting means, and stylus supporting member are all mounted on a frame supported on a universal joint in the casing so as to always occupy the same relative position when the frame shifts by reason of discrepancies between the grooves of the record and the threads of the feed screw. In connection with this construction is employed a centering device which always tends to center the frame when in its lowermost position.

Other features will appear as the specification proceeds.

In the accompanying drawings the invention is embodied in a concrete and preferred form, but changes of construction may be made without departing from the legitimate and intended scope of the invention. Furthermore the several features of the invention may be used, one independently of the other or others.

In the said drawings Figure 1 is a vertical sectional view on the line 1—1 of Fig. 2, showing a sound reproducer or recorder, embodying the invention. Fig. 2 is a plan view of Fig. 1 looking in the direction of the arrow 2 in Fig. 1. Figs. 3, 4, 5, and 6 show various forms of stylus supporting members and stylus. Fig. 7 is a perspective view of one form of stylus. Fig. 8 is a detail of the centering device.

Similar characters of reference indicate corresponding parts in the several views.

1 indicates a casing of any suitable construction in which is mounted the supporting frame 2 by means of the universal joint 3. Opposite to this joint the frame is provided with an inverted V-shaped slot 4 adapted to receive a member 5 carried by the casing. Whenever the sound reproducer is lowered into engagement with the record, the member 5 will center the supporting frame.

6 indicates the usual diaphragm of copper or other material mounted in the supporting frame. Underneath this diaphragm there is pivoted, on the frame 2, the impulse transmitting lever 7 whose free end is adapted to have an intermittent vibratory contact with the diaphragm.

8 indicates a guide in the frame 2 in which is seated the stylus supporting member 9. This stylus supporting member has a reciprocating motion in a rectilinear path and has intermittent vibratory contact with the impulse transmitting lever. The stylus supporting member is preferably constructed as shown in Fig. 3, in which it is in the form of a tube having a restricted mouth 10 on which rests the rotatable stylus 11 here shown in the form of a sphere. Seated in the tube is a follower 12 which is adjustable, and between this follower 12 and the stylus may be interposed an antifriction ball 14. The stylus is thus mounted in a socket whose restricted mouth holds it in place.

In Fig. 4 the stylus is in the form of a knife-edge disk 15 rotatably supported, and in this instance provided with two antifriction balls 14.

In Fig. 5 the stylus is shown in the form of a sphere but is non-rotatable and is held in a solid stylus supporting member 16 having a socket 17 whose mouth is restricted by the flange 18.

In Fig. 6 is shown the same stylus as that in Fig. 4. In this instance, however, it is non-rotatably supported in the socket of the stylus supporting member.

What is claimed is:—

1. A stylus supporting member consisting of a tube whose mouth is provided with a restricted portion, a stylus seated in said tube and resting against the restricted portion aforesaid, and a follower seated in said tube for holding the stylus against the re-

stricted portion aforesaid and serving to prevent longitudinal movement of the stylus in the tubular supporting member.

2. A stylus supporting member having a socket whose mouth is provided with a restricted portion, and a stylus mounted for rotation around its own axis seated in said socket and held in place by the restricted portion aforesaid the stylus and supporting member being arranged to vibrate in unison.

3. A stylus supporting member having a socket whose mouth is provided with a restricted portion forming a pivotal support, and a stylus seated in said socket held against longitudinal vibration therein and rotatably mounted on the pivotal support afforded by the restricted portion.

4. A stylus supporting member having a socket whose mouth is provided with a restricted portion, and a stylus having a circular contact surface concentric with the center of the stylus, seated in said socket and held in place by the restricted portion aforesaid, the stylus being held against vibration in said socket.

5. A stylus supporting member having a socket whose mouth is provided with a restricted portion, and a spherically shaped stylus seated in said socket and held in place by the restricted portion aforesaid and means holding the stylus against longitudinal movement in the socket.

6. A stylus supporting member having a socket whose mouth is provided with a restricted portion, and a stylus having a circular contact surface concentric with the center of the stylus mounted for rotation around its own axis in said socket and held in place by the restricted portion aforesaid the stylus being held against longitudinal axial movement in the socket member.

7. A stylus supporting member having a socket whose mouth is provided with a restricted portion, and a spherically shaped stylus mounted for rotation around its own axis in said socket and held in place by the restricted portion aforesaid and means to prevent longitudinal movement of the stylus in the supporting member.

8. A stylus supporting member consisting of a tube whose mouth is provided with a restricted portion, a stylus mounted for rotation around its own axis seated in said tube and resting against the restricted portion aforesaid, and a follower seated in said tube for holding the stylus against the restricted portion aforesaid to prevent longitudinal movement of the stylus.

9. A stylus supporting member consisting of a tube whose mouth is provided with a restricted portion, a stylus having a circular contact surface concentric with the center of the stylus seated in said tube and resting against the restricted portion aforesaid, and a follower seated in said tube for holding

the stylus against the restricted portion aforesaid.

10. A stylus supporting member consisting of a tube whose mouth is provided with
5 a restricted portion, a spherically shaped stylus seated in said tube and resting against the restricted portion aforesaid, and a follower seated in said tube for holding the stylus against the restricted portion aforesaid.
10 said.

11. A stylus supporting member consisting of a tube whose mouth is provided with a restricted portion, a stylus having a circular contact surface concentric with the
15 center of the stylus mounted for rotation around its own axis in said tube and resting against the restricted portion aforesaid, and a follower seated in said tube for holding the stylus against the restricted portion
20 aforesaid.

12. A stylus supporting member consisting of a tube whose mouth is provided with a restricted portion, a spherically shaped stylus mounted for rotation in said tube and
25 resting against the restricted portion aforesaid, and a follower seated in said tube for holding the stylus against the restricted portion aforesaid.

13. In a sound reproducer or recorder, a
30 diaphragm, a stylus supporting member having a rectilinear reciprocating motion, and impulse transmitting means between the stylus supporting member and diaphragm.

14. In a sound reproducer or recorder, a
35 casing a supporting frame mounted in said casing so as to have play both in a vertical and horizontal direction, a diaphragm, a stylus supporting member, and an impulse transmitting means, all mounted on the supporting frame.
40

15. In a sound reproducer or recorder, a diaphragm, a stylus supporting member having a rectilinear reciprocating motion, and an impulse transmitting lever pivotally
45 supported interposed between the diaphragm and stylus supporting member.

16. In a sound reproducer or recorder, a diaphragm, a stylus supporting member having a rectilinear reciprocating motion,
50 and impulse transmitting means disconnected from the diaphragm and adapted to have an intermittent vibratory contact with the diaphragm.

17. In a sound reproducer or recorder, a casing, a supporting frame mounted in said
55 casing so as to have play both in a vertical and horizontal direction, a stylus supporting member adapted to reciprocate in a guide on the frame, a diaphragm carried by said frame, and an impulse lever, pivotally
60 mounted in the frame above the stylus supporting member, whose free end engages the diaphragm.

18. In a sound reproducer or recorder, a casing, a supporting frame, pivotally sup-
65 ported in the casing so as to have a universal movement, and carrying a diaphragm, impulse transmitting means and a stylus supporting member, and means for centering the supporting frame when in its lowermost
70 position.

19. In a sound reproducer or recorder, a diaphragm, a stylus supporting member, an impulse transmitting lever interposed between the diaphragm and stylus supporting
75 member, and a freely rotatable stylus carried by the stylus supporting member.

20. A supporting member, a spherical stylus mounted for rotation in all directions in said member but held against longitudinal
80 axial movement therein.

21. In a sound reproducer or recorder, a stylus, and a socket member supporting the stylus, extending below the axis thereof and having confining means for the stylus, the
85 stylus being held against longitudinal movement in the socket member.

22. In a sound reproducer or recorder, a diaphragm, a stylus supporting member, an impulse transmitting means disconnected
90 from both the stylus supporting member and diaphragm and adapted to have intermittent vibratory contact with both, a casing, and a supporting frame mounted on a universal joint in the casing and carrying
95 the diaphragm, stylus supporting member and impulse transmitting means.

Signed at Brooklyn, in the county of Kings and State of New York this 6th day of May, A. D. 1908.

CHARLES THOMA, JR.
WALTER THOMA.

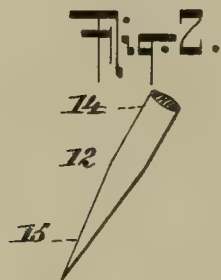
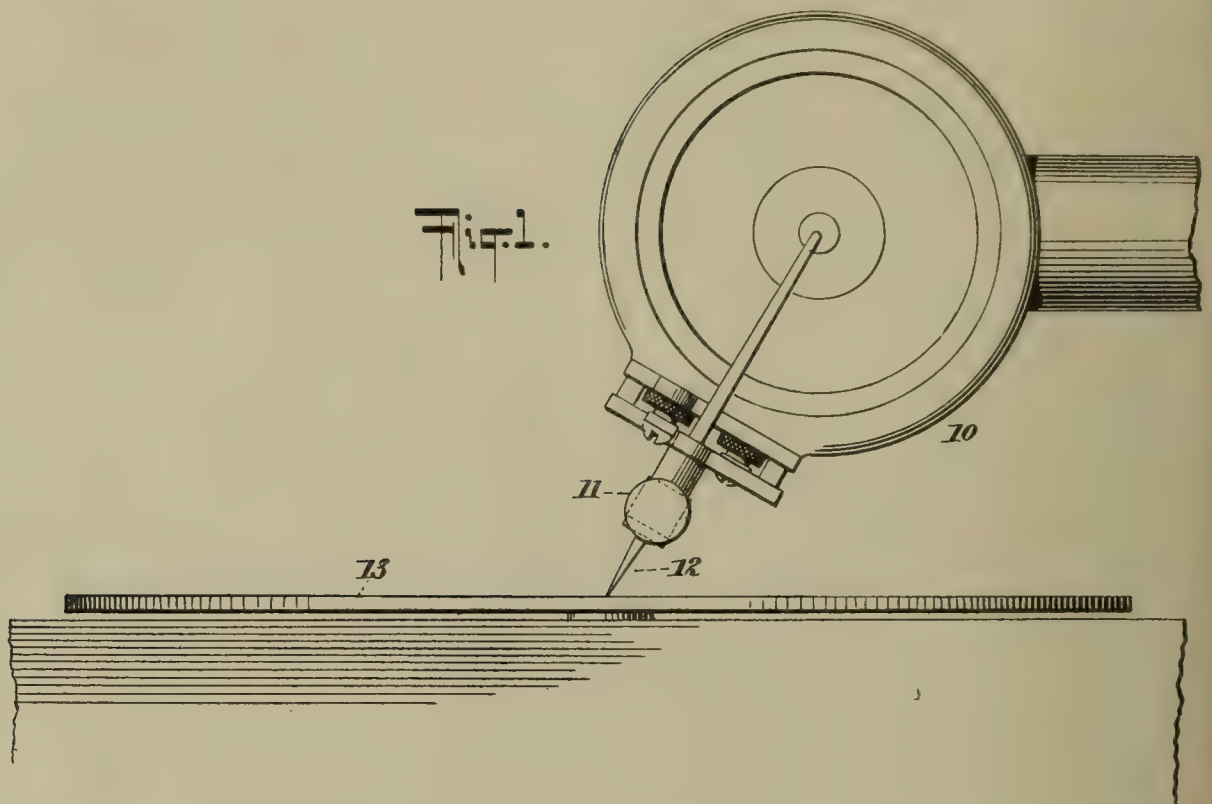
Witnesses:

FRED. H. MCGAHIE,
G. W. A. MURRAY.

C. H. NORTON.
SOUND REPRODUCING MACHINE.
APPLICATION FILED JUNE 24, 1908.

950,024.

Patented Feb. 22, 1910.



WITNESSES:

Gustave Dietrich.
George Barnaby.

- INVENTOR

Charles H. Norton

BY

Chas. C. Gill
ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES H. NORTON, OF NEW YORK, N. Y.

SOUND-REPRODUCING MACHINE.

950,024.

Specification of Letters Patent.

Patented Feb. 22, 1910.

Application filed June 24, 1908. Serial No. 440,064.

To all whom it may concern:

Be it known that I, CHARLES H. NORTON, a citizen of the United States, and a resident of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Sound-Reproducing Machines, of which the following is a specification.

The invention relates to improvements in sound-reproducing machines, and it consists in the novel needle or stylus hereinafter described and claimed for use in such machines.

It is well known that the metal needles commonly employed in sound-reproducing machines possess inherent defects in that they wear on the records, create a scratching noise which interferes with the proper reproduction of the sounds and lack the capability, in large measure, of reproducing sounds in soft, distinct, modulated tones. It is also well known that various attempts have been made to improve the needles and to remedy some of the objections to them by the use of materials other than metal in their construction. In the use of materials other than metal in the construction of the needles various other objections developed both in difficulties of manufacture and increased expense to the owners of sound-reproducing machines and otherwise.

The object of my invention is to produce a needle or stylus for sound-reproducing machines which may be supplied at slight expense and which in use will eliminate the scratching noise caused by metal needles, reduce to a minimum the wear on the records and materially improve the tone and distinctness of the instrument, the sounds being soft or modulated and those representing various voices or instruments being clearly differentiated one from the other.

I have discovered that by making the needle or stylus of hard or vulcanized rubber, I secure a very great improvement in the general tone of the instrument and more distinct, accurate and natural reproductions of the sounds, and in addition obviate any rapid wearing out of the records or excessive expense for needles. The needle or stylus of my invention is, therefore, intended for use in machines employing disk-records and

is formed of hard rubber. The needle may be either solid or hollow above its point, and I prefer the hollow hard rubber needle in respect of its efficiency and tone-qualities.

My invention is illustrated in the accompanying drawings, in which:

Figure 1 is an elevation of a portion of a sound-reproducing machine equipped with a hard or vulcanized rubber needle of my invention applied to the ordinary disk-record employed in such machines; Fig. 2 is a perspective view, on an enlarged scale, of the needle, and Fig. 3 is a like view of the same needle shown as hollow above its pointed lower end portion.

In the drawings, 10 designates the reproducer-head of a sound-reproducing machine of known construction, 11 the usual needle or stylus-holder thereof, 12 the needle or stylus, and 13 a rotary disk-record.

My invention pertains to the needle or stylus 12 which comprises a shank-portion 14 adapted to the holder 11 and a pointed lower end portion 15 to engage the record 13. The needle or stylus 12 of my invention is made of hard or vulcanized rubber, and preferably this needle is hollow above its lower pointed portion, although it may be solid throughout.

The needle 12 of hard or vulcanized rubber possesses the property, in connection with the record and machine, of reproducing the sounds in especially distinct and natural tones, without harshness and without undue wear on the records. The hard or vulcanized rubber needle of my invention lacks fibrous and gritty substances and is somewhat yielding or capable of flexion or spring action at its lower end, all of which not only improves its tone reproducing-qualities but lessens the wear on the records, which is a matter of considerable importance.

The general results accomplished by my invention are that the tone-quality of the instrument is greatly improved, that the needles may be supplied at small expense and that the life of the records, due to the reduction in wear by the needles, is materially increased. The absence of fibrous and gritty matters in the needle and its formation of hard rubber enables its efficient use in accurately and delicately following the

sinuous convolutions of the groove in the record, without danger of leaving the same or of excessive wear on the record.

What I claim as my invention and desire
5 to secure by Letters-Patent, is:

1. A sound reproducing machine comprising a head, a disk-record and a needle of hard rubber for coaction therewith.

2. A sound reproducing machine comprising
10 a head, a disk-record and a needle of

hard rubber for coaction therewith, said needle above its lower pointed portion being hollow.

Signed at New York city, in the county of New York, and State of New York, this 23rd day of June A. D. 1908.

CHARLES H. NORTON.

Witnesses:

ROBT. J. KEEGAN,

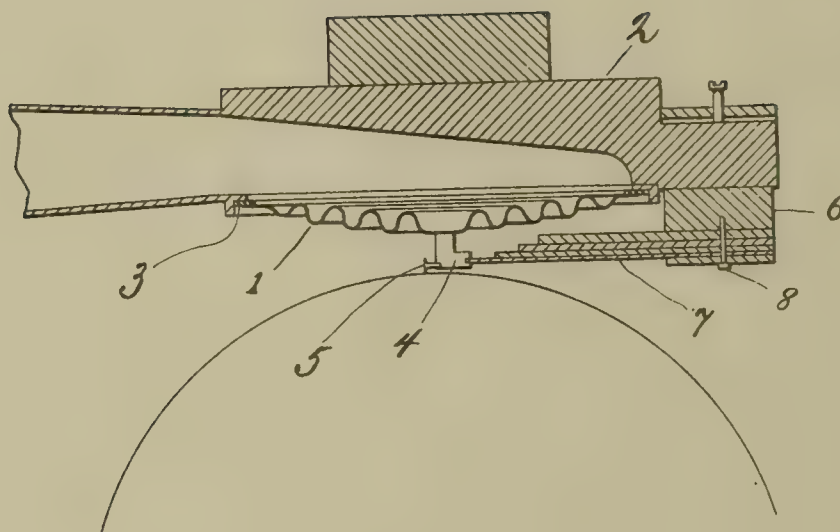
E. C. BOEHME.

Both of these claims appear to me to be invalid - There is no new combination. The head, turn arm is the needle (if it is new) The counter of a head - disk-record & a needle is old.

T. A. EDISON.
PHONOGRAPHIC RECORDING APPARATUS.
APPLICATION FILED MAY 24, 1905.

950,226.

Patented Feb. 22, 1910.



Attest:
Edgeworth Greene
Minio, C Mac Arthur

Inventor:
Thomas A. Edison
by *Frank L. Hyer* Att'y.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPHIC RECORDING APPARATUS.

950,226.

Specification of Letters Patent.

Patented Feb. 22, 1910.

Application filed May 24, 1905. Serial No. 261,952.

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, residing at Llewellyn Park, Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographic Recording Apparatus, (Case D,) of which the following is a description.

My invention relates to various improvements in phonographic recording apparatus, and my object is to provide an apparatus for the purpose, wherein superior results can be obtained.

I find that vibrations of abnormal amplitude, caused by very high, shrill tones, like those of a soprano voice, or resulting from abnormal reinforcements of certain tones by the tone due to the resonance of the air column in the funnel, result in the cutting stylus leaving the record surface, producing the disagreeable effect of blasting. This result is due to the fact that the diaphragm in vibrating toward the record surface encounters the very considerable resistance imposed upon the stylus in effecting the cutting of the material, while in vibrating in the opposite direction, the diaphragm encounters little or no resistance. Consequently, under the effect of condensations of sound waves, the movement of the diaphragm is limited; while under the effect of the rarefaction of sound waves, the movement of the diaphragm becomes abnormal and permits the stylus to jump free of the record surface.

To carry my invention into effect, I arrange the cutting stylus and the parts with which it operates, so that the resistance imposed on the diaphragm shall be approximately the same in moving away from, as when moving toward the record surface, whereby the stylus will be prevented from leaving the record surface, and blasting will be eliminated. I attain this result by employing a compound spring, which coöperates with the diaphragm and having the capacity of absorbing energy by friction. This compound spring offers a very small and negligible resistance to the movement of the diaphragm toward the record surface, and consequently, in such movement, practically the only resistance encountered is that due to the cut-

ting action of the stylus, which as stated, increases with the amplitude. In moving in the opposite direction (*i. e.* away from the record surface) the compound spring imposes a resistance upon the diaphragm likewise increasing with the amplitude, and the energy of the diaphragm in such movement is largely absorbed as friction in the spring itself, as will be explained. By absorbing energy as friction, instead of as elasticity, I prevent the spring from imparting stored up energy to the diaphragm to distort its movements. By imposing a great retardation to the abnormal movements of the diaphragm away from the recording surface, I prevent the stylus from leaving the record material and confine the record to the material, without diminishing the sensitiveness of the recording mechanism, a result not heretofore achieved.

In order that the invention may be better understood, attention is directed to the accompanying drawing, forming part of this specification, and in which I illustrate a sectional view of a recording mechanism equipped with the improved compound spring.

The diaphragm 1 is provided with concentric corrugations, so as to be very rigid, and is secured within the head 2 by means of a ring 3, preferably of soft rubber, as I describe in applications filed contemporaneously herewith, Serial Nos. 261,949 and 261,950. A magnesium foot 4, carrying a suitable recording stylus 5, is cemented or otherwise secured to the diaphragm. Extending between the foot 4, and an arm 6, depending from the head 2, is a compound spring 7, composed of a plurality of leaves, like a wagon spring, and formed preferably of bamboo. These leaves are of reduced length and of increased cross-section upward from the lowermost, which connects directly with the foot 4, by being cemented in a recess therein. The spring leaves are held together at their anchored end by a screw 8, but are free to move independently at their other end. Consequently, the movement of the stylus toward the record surface will flex only the lowermost and weakest spring leaf with little or no retardation from that cause, but movements in the op-

posite direction, when the tracking depth is passed, will result in a flexing of one or more of the other leaves, to impose a resistance which increases with the amplitude, since the leaves are of increasing stiffness toward the uppermost. In thus flexing the several leaves, the latter are moved or rubbed longitudinally over one another, so as to absorb energy by friction.

10 In assembling the parts, the foot 4 is first secured to the compound spring, the diaphragm is cemented in place, and the spring fastened at its anchored end to the arm 6. When the diaphragm and spring are thus
15 unstrained, the foot is cemented to the center of the diaphragm by melted shellac, leaving the whole recorder free from abnormal strains. By extending the spring between the foot 4 and the arm 6, it acts as a
20 rod to take up the thrust imposed upon the stylus.

In recording, the stylus is allowed to track into the recording material to the proper depth by any suitable mechanism (not
25 shown) for adjusting the cut. This produces a slight upward flexing of the diaphragm and compound spring. The spring offers scarcely any retardation to the progression of the stylus into the recording material, and practically all the resistance is that imposed by the cutting action. In moving in the opposite direction the compound spring creates as nearly as possible, a corresponding retardation, and thus one defect
30 balances the other and true waves are recorded, since the friction of the leaves moving on each other results in a loss of energy substantially equivalent to that lost in performing a cutting operation. For waves of
40 small amplitude, such as harmonics, the recorder loses none of its sensitiveness, but for prime tones of great amplitude (for instance, the notes of a piece of music played on a piano, which are in resonance with the
45 tone of the recording funnel, and which result in amplitudes more than twice as great as the other tones) the increasing power to flex the compound spring as the diaphragm moves upward is sufficient to reduce the amplitude to such a degree as will prevent the
50 stylus from leaving the record surface, and thereby prevent blasting.

Having now described my invention, what I claim as new therein and desire to secure
55 by Letters Patent is as follows:

1. A phonographic sound recording apparatus, comprising in combination a diaphragm, a stylus connected therewith, and means for imposing a resistance to the movements of the diaphragm away from the recording surface, said resistance increasing with the amplitude with acceleration throughout the whole of each such move-

ment of considerable amplitude, substantially as set forth.

2. A phonographic sound recording apparatus, comprising in combination, a diaphragm, a recording stylus connected therewith, and spring means for retarding the diaphragm in its movement away from the recording surface, arranged to dissipate as friction a considerable part of the energy of the diaphragm in such movement, substantially as set forth.

3. A phonographic sound recording apparatus, comprising in combination a diaphragm, a recording stylus connected therewith, and means for causing the diaphragm in its movement away from the recording surface to develop friction and thereby retard the same, such retardation increasing with the amplitude with acceleration throughout the whole of each such movement of considerable amplitude, substantially as set forth.

4. A phonographic sound recording apparatus, comprising in combination a diaphragm, a recording stylus connected therewith, and a compound spring anchored at one end and secured at the other to said stylus, substantially as set forth.

5. A phonographic sound recording apparatus, comprising in combination a diaphragm a recording stylus connected therewith, and a compound spring anchored at one end and secured at the other to said stylus, the leaves of said spring being of progressively decreasing length, substantially as set forth.

6. A phonographic sound recording apparatus, comprising in combination a diaphragm, a recording stylus connected therewith, and a compound spring anchored at one end and secured at the other to said stylus, the leaves of said spring being of progressively increasing thickness, substantially as set forth.

7. A phonographic sound recording apparatus, comprising in combination a diaphragm, a recording stylus connected therewith, and a compound spring made of bamboo anchored at one end and connected at the other to said stylus, substantially as set forth.

8. A phonographic sound recording apparatus comprising in combination a diaphragm, a recording stylus connected therewith and means for imposing a resistance to the movement of the diaphragm away from the recording surface corresponding throughout the movement to the resistance imposed by the cutting action of the stylus to the movement of the diaphragm toward the recording surface throughout such movement, substantially as set forth.

9. Phonographic sound recording appara-

tus comprising in combination a diaphragm,
a recording stylus connected therewith and
means for dissipating as friction on the
movement of the diaphragm away from the
5 recording surface an amount of energy sub-
stantially equivalent to that lost in the cut-
ting operation on a movement of the stylus
toward the recording surface equal in ampli-

tude to the first mentioned movement, sub-
stantially as set forth.

10

This specification signed and witnessed
this 20th day of May, 1905.

THOS. A. EDISON.

Witnesses:

FRANK L. DYER,
ANNA R. KLEHM.

F. P. BECK.
 DUPLEX REPRODUCER FOR PHONOGRAPHS.
 APPLICATION FILED SEPT. 4, 1907.

950,428.

Patented Feb. 22, 1910.

2 SHEETS—SHEET 1.

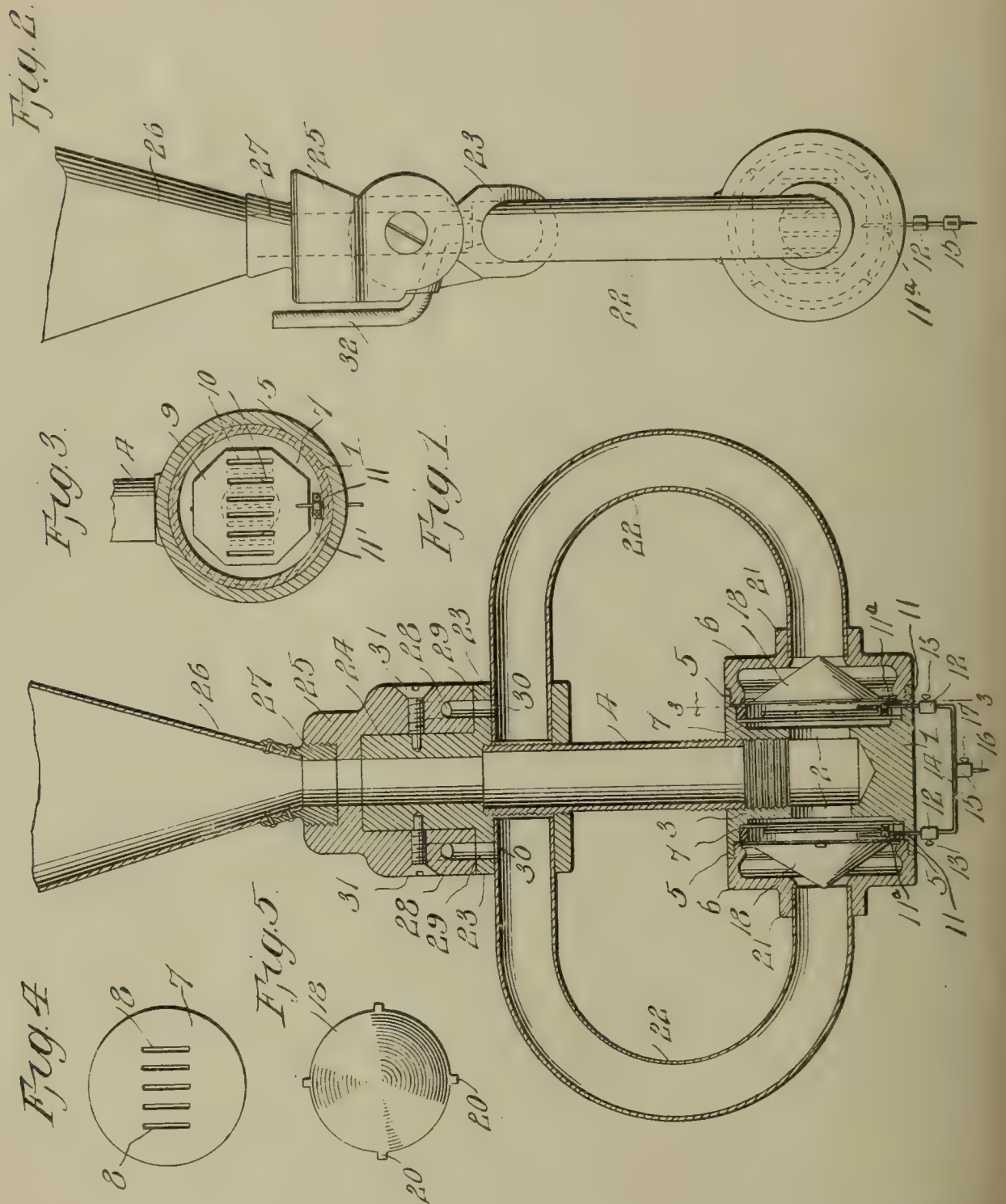


Fig. 4

Fig. 5

Witnesses

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[Signature]

Inventor

Frank P. Beck,

By Victor J. Evans

Attorney

F. P. BECK.
 DUPLEX REPRODUCER FOR PHONOGRAPHS.
 APPLICATION FILED SEPT. 4, 1907.

950,428.

Patented Feb. 22, 1910.

2 SHEETS—SHEET 2.

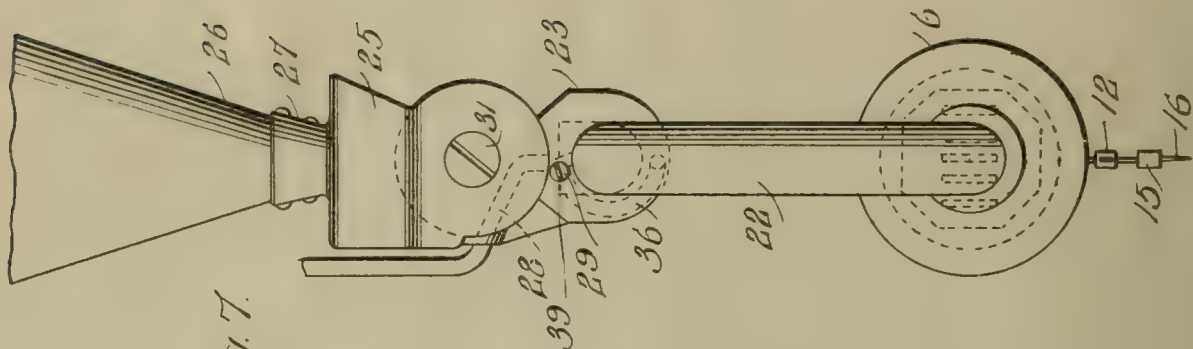


Fig. 7.

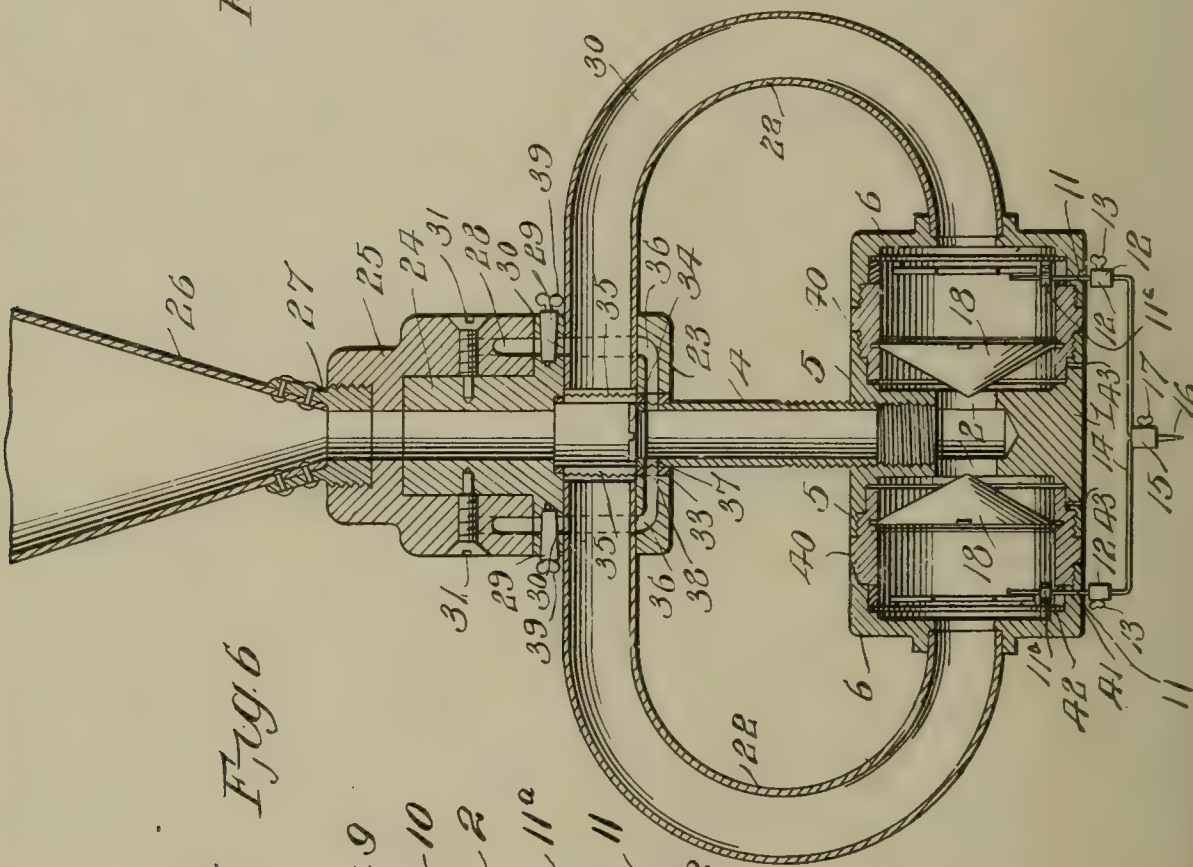
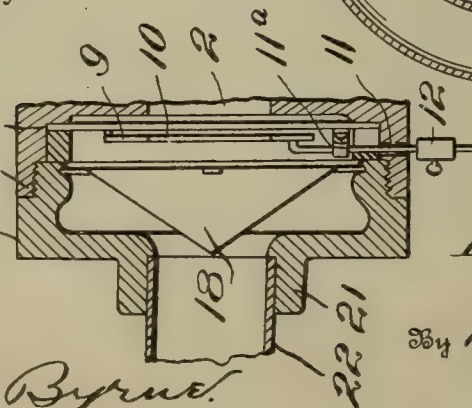


Fig. 6.

Fig. 8.



Witnesses

Frank Hough

John F. Byrne.

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UNITED STATES PATENT OFFICE.

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DUPLEX REPRODUCER FOR PHONOGRAPHS.

950,428.

Specification of Letters Patent.

Patented Feb. 22, 1910.

Application filed September 4, 1907. Serial No. 391,359.

To all whom it may concern:

Be it known that I, FRANK P. BECK, a citizen of the United States of America, residing at Richmond, in the county of Henrico and State of Virginia, have invented new and useful Improvements in Duplex Reproducers for Phonographs, of which the following is a specification.

This invention relates to duplex reproducers for phonographs, and one of the principal objects of the same is to provide means for conveying compressed air through the sound box and up into the outlet horn.

Another object of the invention is to provide a plurality of sound boxes, and means for conveying compressed air through the sound boxes and out through the horn, the purpose being to amplify the reproduction of sound records, and to do away with the ordinary diaphragm.

These and other objects may be attained by means of the construction illustrated in the accompanying drawing, in which:

Figure 1 is a central vertical section of a reproducer made in accordance with my invention. Fig. 2 is a side elevation of the same. Fig. 3 is a vertical section on the line 3—3, of Fig. 1, looking in the direction indicated by the arrow. Fig. 4 is a plan view of the stationary disk or diaphragm in the sound box. Fig. 5 is a plan view of the conical air deflector. Fig. 6 is a central vertical section of a modified form of the reproducer, and Fig. 7 is a side elevation of the same. Fig. 8 is a detail sectional view, illustrating the manner of mounting the wires 11 in the sound box.

Referring to the drawing for a more particular description of my invention, the numeral 1 designates the body portion of the sound box provided with openings 2 which communicate with an interiorly threaded portion 3 in which is adjustably fitted a tube 4. The body portion 1 is provided with interior screw threads 5 at the outer ends thereof, and fitted in the outer ends of said body portion 1 are the outer members 6 of the sound boxes. Fitted between the members 1 and 6 of the sound box at opposite sides thereof are port plates 7 provided with a series of vertical slots 8, said plates being clamped between said two members 1 and 6, as shown in Fig. 1. A vibratory disk 9 also provided with slots 10 which are disposed out of alinement with the slots 8, as shown more particularly in

Fig. 3, is secured one upon each side of the sound box at the side of the disk 7, said vibratory disk being supported upon a wire 11, and said wires 11 passing through openings in the box of sufficient size to permit the disk to vibrate, said wires being adjustably connected to a clamp 12 provided with a set screw 13. The wires 11 pass through keepers 11^a secured to the sound box body. Also connected to the clamp 12 is a cross bar 14, said cross bar having a needle holder 15 centrally disposed thereon to receive a stylus or needle 16 which is held in place by means of a set screw 17. Thin sheet metal air deflectors 18 of conical formation and provided with peripheral lugs 20, are secured to the members 6 by means of the lugs 20, and the space between the lugs 20 and the periphery of the deflector 18 forms inlet openings for the passage of the compressed air. Fitted to bosses 21 on the box members 6 are curved air tubes 22, the upper ends of which are fitted in a nipple 23 projecting at opposite sides of a hollow boss 24 in which is adjustably fitted the tube 4 between the ends of the pipes 22. Hinged to the boss 24 is a horn support 25 to which a horn 26 is suitably fitted, as by a threaded nipple 27. The horn support 25 is provided with air passage 28 which communicate with openings 29 in the nipple 23 and the air pipes 22 are provided with openings 30 which communicate with the air passages. The horn support 25 is pivoted upon the screws 31 which pass through the horn support and have their inner ends disposed upon opposite sides of the boss 24. Flexible air pipes 32 communicate with the air passages 28 and said air pipes 32 are connected to some suitable source of compressed air.

The operation of my invention may be briefly described as follows: When the stylus 16 is placed upon a record and the record revolved, compressed air is forced through the tube 32 and through the air pipes 22 against the deflectors 18, the air being carried up and around the periphery of said deflectors into the sound box and the vibrating disk 9 is moved by the movement of the stylus and also by the air which passes through the same and through the stationary port plates 7, the air thus conveying the sound up through the tube 4 and out through the horn 26.

In Figs. 6 and 7 of the drawings, I have illustrated a reproducer including a struc-

ture which will permit the sound to be conveyed through the tube 4 or through the tubes 22, as the operator may elect. In this construction of the reproducer, the upper
 5 end of the tube 4 has threaded engagement with a sleeve 33 mounted in the nipple 23, and is threaded for the reception of a plug 34. The sleeve 33 is provided with openings 35, and the sleeve is so mounted that
 10 it may be turned to register said openings with the ends of the tubes or throw them out of registration therewith. The nipple 23 is provided with air passages 36 which communicate with the air passages 28 ad-
 15 jacent the openings 29 and with the tube 4 below the plug 34 through the medium of openings 37 in the tube 5 and openings 38 in the sleeve 33. It should be observed that when the openings 35 register with the
 20 ends of the tubes 22, the openings 38 register with the openings 33 and air passages 36, and that when the openings 35 are out of registration with the ends of the tubes 22 communication between the passages 36
 25 and tube 4 is cut off. Valves 39 are mounted in the nipple 23 at the intersections of the passages 36 and openings 29 and provided with means by which air may be directed through the openings 29 into the tubes 22
 30 or through the passages 36 into the tube 4. The outer members 6 of the sound box are adapted to be connected to the body portion thereof by means of coupling members 40, which carry the air deflectors 18 and be-
 35 tween which and the members 6 or the body portion 1, the diaphragms 7 are mounted. When it is desired to convey the sound through the tubes 22, the sleeve 33 is turned so that the openings 35 and 38 therein will
 40 register with the ends of the tubes 22 and with the passages 36 and openings 37 in the tube 4, thereby establishing communication between the horn 26 and the tubes 22 and between the air passages 28 and the
 45 tube 4. The deflectors 18 are arranged in opposition to the openings 2, and the diaphragms 7 are secured between the couplings 40 and the outer members 6 of the sound boxes. As vibrator disks 9 must be
 50 located between the deflectors 18 and the diaphragms 7, a longer cross bar 14 is used, and the wires 11 connected thereto are passed through the openings 41 in the outer members 6 and the openings 42 in the
 55 couplings 40. With the parts arranged in this manner and the valves 29 opened to permit the air to pass from the passages 28 to the passages 36, the air may be directed to the tube 4 against the deflectors 18 and
 60 around the same into the sound boxes, then through the diaphragms 7 and 9 to the tubes 22 and thence out through the horn 26. When it is desired to convey the sound through the tube 4 to the horn 26, the valves
 65 29 are turned to cut off communication be-

tween the air passages 28 and 36; the plug 35 removed; the sleeve 33 turned so that the openings 35 and 38 will be out of registration with the tubes 22 and 4; the couplings 40 registered so that the deflectors 18
 70 will be in opposition to the ends of the tubes 22, and the diaphragms 7 secured between the body portion 1 and the couplings. With the parts in this position, it is necessary to use a shorter cross bar 14 and the
 75 wires 11 connected to the diaphragms 9, passed through the openings 43 and the openings 42 and the coupling members 40.

From the foregoing it will be obvious that either one or the other of the sound boxes
 80 may be cut out by passing compressed air through one only of the pipes 32, that any suitable number of sound boxes may be used and that the record is very much amplified owing to the number of sound boxes and the
 85 manner of forcing compressed air through the same and out through the outlet horn.

From the foregoing description taken in connection with the accompanying drawings, the construction and mode of operation
 90 of the invention should be understood without a further extended description.

Changes in the form, proportions and minor details of construction may be made within the scope of the claims without de-
 95 parting from the spirit or sacrificing any of the advantages of the invention.

Having thus described the invention, what I claim is:—

1. A sound reproducer comprising a plu-
 100 rality of sound boxes, deflectors in said boxes, curved air pipes connected to said boxes at one end, a hinged horn support, oppositely disposed nipples to which said air pipes are connected, and an adjustable tube connect-
 105 ing the sound box with said nipples.

2. A sound reproducer comprising a sound box, a coupling member secured to the sound box, a deflector secured to the coupling member, the outer member of the sound box be-
 110 ing secured to the coupling member, a stationary port plate secured between the coupling member and the sound box, said port plate being provided with slots, a movable slotted diaphragm mounted between the de-
 115 flector and the stationary port plate, a stylus connected to the movable diaphragm, a tube communicating with the sound box, another tube communicating with the outer member of the sound box, and means for conveying
 120 air through one or the other of said tubes.

3. A sound reproducer including a sound box, a deflector, a diaphragm, a stylus connected to the diaphragm, tubes connected to the sound box, and means for directing air
 125 through one or the other of said tubes.

4. A sound reproducer including a sound box, a deflector, a diaphragm, a stylus connected to the diaphragm, tubes connected to the sound box, a nipple connecting the tubes
 130

at their opposite ends, a horn carried by the
nipple, a removable plug carried by one of
the tubes, a sleeve carried by the nipple and
adapted to cut off communication between
5 the horn and one of the tubes, and means by
which air may be conveyed through one or
the other of said tubes to the sound box.

In testimony whereof I affix my signature
in presence of two witnesses.

FRANK P. BECK.

Witnesses:

BEN BERGMANN,
GEO. C. WILES.

E. R. JOHNSON.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED FEB. 9, 1907.

951,127

Patented Mar. 8, 1910.

Fig. 1.

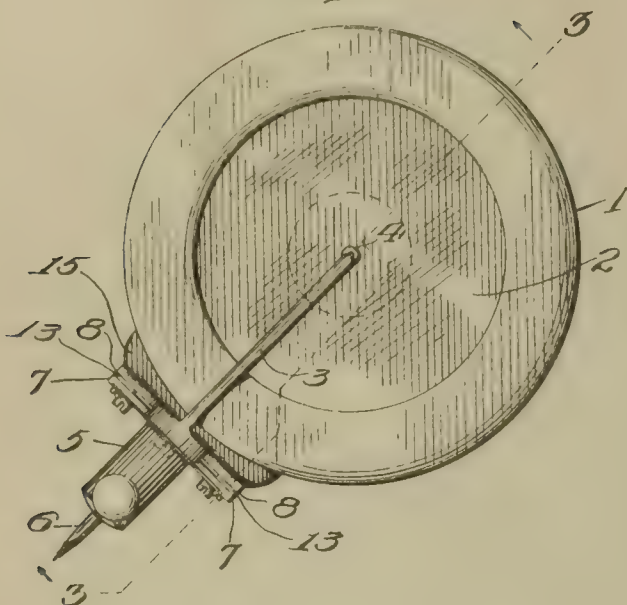


Fig. 2.

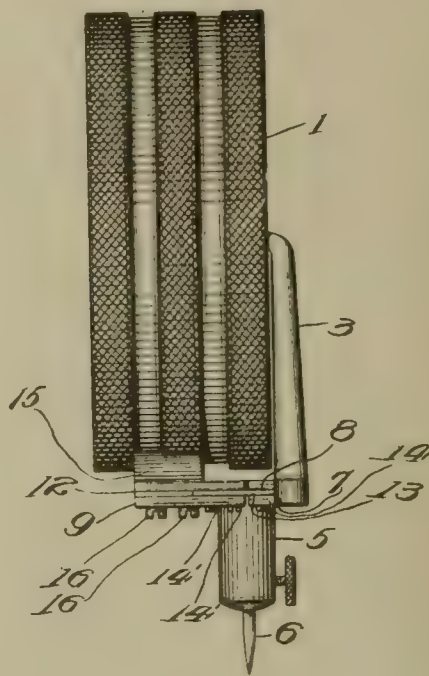


Fig. 3.

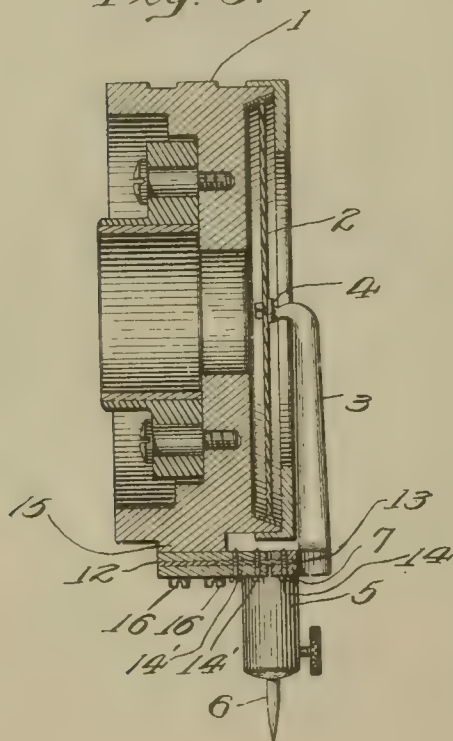
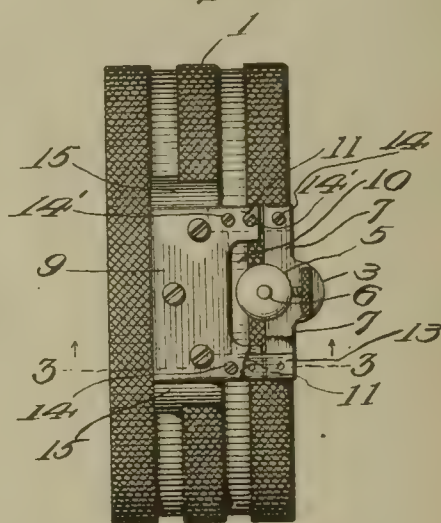


Fig. 4.



INVENTOR

Eldridge R. Johnson.

WITNESSES

W. J. Hartman.
Alston B. Moulton

BY

Harold Pettit

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UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF MERION, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-BOX FOR TALKING-MACHINES.

951,127.

Specification of Letters Patent.

Patented Mar. 8, 1910.

Application filed February 9, 1907. Serial No. 356,530.

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of Merion, county of Montgomery, State of Pennsylvania, have invented certain new and useful Improvements in Sound-Boxes for Talking-Machines, of which the following is a full, clear, and complete disclosure, reference being had to the accompanying drawings, forming part of this specification.

The main objects of this invention are; to provide a stylus bar and mounting therefor of simple construction and of few parts, and having no parts subject to wear due to the oscillation of the bar, or likely to become loose and to permit of lost motion of the bar; to provide an improved mounting for a stylus bar that will permit the bar to oscillate in a single plane about a substantially fixed axis but which will hold the bar rigidly against any other movement with respect to its mounting; to provide an improved mounting for a stylus bar which will counteract any undesirable momentum or movement of the bar; to provide in a sound box an improved stylus bar and mounting therefor in combination with a diaphragm, in which the axis of oscillation of the stylus bar will be in the plane of the diaphragm, so that the movement of the end of the stylus bar connected to the diaphragm will be in a direction perpendicular to the diaphragm so as not to exert any oblique stress upon the diaphragm tending to buckle it; and to provide other improvements as will appear hereinafter.

In the accompanying drawings, Figure 1 is a front elevation of a sound box constructed in accordance with this invention; Fig. 2 is a side elevation of the same; Fig. 3 a longitudinal section on lines 3—3 of Figs. 1 and 4; and Fig. 4 a fragmentary bottom plan view of the sound box.

Referring to the drawings, the improved sound box comprises the usual cylindrical casing 1 supporting the usual diaphragm 2. The stylus bar 3 is connected at its upper end 4 to the diaphragm by any suitable means, and the lower end 5 of the stylus bar is offset and provided with a central socket adapted to receive the stylus 6. The stylus bar is provided with a pair of oppositely projecting rigid lateral extensions 7—7 each of which has at its outer end a slot 8. The stylus bar mounting comprises a rigid lami-

nated supporting plate 9, which is substantially rectangular in general outline, and is provided upon its edge adjoining the stylus bar with a recess 10 adapted to receive the offset portion of the bar, leaving a rigid bifurcated arm 11 projecting rigidly outwardly on each side of the supporting plate. The rigid supporting plate is preferably formed of three thicknesses or laminations, the central thickness being less in width than the width of the other thicknesses and extending from the inner edge of the recess 10 to the opposite edge of the plate, leaving open spaces or slots 12 between the outer thicknesses of the arms of said plate, thus forming the said bifurcated arms 11.

The stylus bar is yieldingly connected to the rigid supporting plate 9 by means of a pair of spaced yielding members 13, each one of which is fastened at one end in one of the said slots 8 of the lateral extensions of the stylus bar, by means of a single screw 14, and at its opposite end in the corresponding slot 12 in the arm of the supporting plate, by means of two screws 14'. The yielding members are preferably arranged parallel to each other, to secure strength and simplicity of construction, but the arrangement might be varied for instance by having the members converge or diverge, and the members would still perform their functions. These yielding members 13 are preferably made of comparatively thin spring steel, oblong in cross section, and preferably tempered; but it is obvious that practically any flexible material may be used instead of steel. When steel or any other resilient material is used for the yielding members, the resiliency of the material acts to counteract the momentum of the bar when it oscillates. Steel springs for this purpose can be made as thin and yielding as desired, and tempered to any degree of resiliency preferred, and owing to the simplicity of their design, the springs may be made cheaply in quantities with great uniformity. To restrain the stylus bar to oscillate upon a substantially fixed axis, the bar and its fixed supporting plate are spaced only a very short distance apart, the distance being only sufficient to permit of the necessary oscillation of the bar, without bringing the bar into contact with the plate, and the yielding members supporting the bar are therefore permitted to flex only

about a substantially fixed axis constituting the axis of oscillation of the bar.

From this description it will be apparent that the ends of the steel springs 13 are entirely inclosed and clamped between the laminations of the rigid supporting plate 9 on the sound box casing and the rigid lateral extensions 7 of the stylus bar. These clamping means render the entire length of the said springs rigid except that a very minute portion of the same which forms the axis of the oscillation of the stylus bar. As has been pointed out the distance between the clamping members of the casing and of the stylus bar is preferably only sufficient to permit the stylus bar to oscillate without effecting any engagement or contact between said clamping members. By this construction the stylus bar is restrained to oscillate upon a fixed axis, or in other words the axis of oscillation of the stylus bar is always in the same position with respect to the casing and to the stylus bar irrespective of the weight of the sound box or the pressure to which it may be subjected on account of any inequalities or irregularities in the record which is being produced.

The supporting plate 9 is rigidly but removably secured to a lug or support 15 upon the casing of the sound box 1, by means of screws 16, and is arranged so that the axis of oscillation of the stylus bar and the longitudinal axis of the stylus socket are substantially in the central plane of the diaphragm. When the stylus bar is thus mounted, the movement of the end of the bar connected to the diaphragm will be in a direction perpendicular to the plane of the diaphragm.

Although this invention has been illustrated only in its preferred form, many changes might be made in the construction shown without departing from the spirit of this invention or the scope of the following claims.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:

1. The combination with a stylus bar, of spaced yielding members free to bend but held against torsion, said members extending transversely of said bar, forming the sole support thereof, and restraining said bar to oscillate upon a substantially fixed axis.

2. The combination with a stylus bar, of spaced spring members free to bend but held against torsion, said springs extending transversely of said bar, forming the sole support thereof, and restraining said bar to oscillate upon a substantially fixed axis.

3. The combination with a stylus bar, of spaced flat spring members free to bend but held against torsion, said spring members extending transversely of said bar, forming

the sole support thereof, and restraining said bar to oscillate upon a substantially fixed axis.

4. The combination with a stylus bar provided with rigid lateral extensions, of yielding members connected to said extensions and extending transversely of said bar, said yielding members forming the sole support for said bar, and restraining said bar to oscillate upon a substantially fixed axis.

5. In a sound box, a stylus bar provided with rigid lateral extensions and yielding members connected to said extensions and extending transversely of said stylus bar forming the sole support for said stylus bar, said bar being retained to oscillate upon a substantially fixed axis.

6. In a sound box, the combination with a diaphragm, of a stylus bar having a stylus socket, and spaced yielding supports for said bar extending in substantially the same direction therefrom and transversely thereof, the longitudinal axis of said socket being substantially in the plane of the diaphragm.

7. In a sound box, the combination with a diaphragm, of a stylus bar having a stylus socket, and spaced yielding supports for said bar extending in substantially the same direction therefrom, the longitudinal axis of said socket and the axis of oscillation of the said bar being substantially in the plane of the diaphragm.

8. In a sound box, the combination with a diaphragm, of a stylus bar, rigid lateral extensions arranged upon opposite sides of said bar and rigid therewith, and yielding supports for said bar secured transversely of said bar to said extensions and projecting in substantially the same direction therefrom, said bar being restrained to oscillate upon a substantially fixed axis.

9. In a sound box, the combination with a diaphragm, of a stylus bar, rigid lateral extensions arranged upon opposite sides of said bar and rigid therewith, and flat spring supports for said bar secured transversely of said bar to said extensions and projecting in substantially the same direction therefrom, said bar being restrained to oscillate upon a substantially fixed axis.

10. In a sound box, the combination with a diaphragm, of a stylus bar having a stylus socket, rigid lateral extensions arranged upon opposite sides of said bar and rigid therewith, and yielding supports for said bar secured transversely of said bar to said extensions and projecting in the same direction therefrom, the longitudinal axis of said socket being in a plane perpendicular to the axis of oscillation of said bar, and said axis of oscillation being substantially fixed.

11. In a sound box, the combination with a diaphragm, of a stylus bar having a stylus socket, rigid lateral extensions arranged upon opposite sides of said bar and rigid

therewith, and yielding supports for said bar secured transversely of said bar to said extensions and projecting in the same direction therefrom, the longitudinal axis of said socket being in the plane of the diaphragm.

12. In a sound box, the combination with a diaphragm, of a stylus bar having a stylus socket, rigid lateral extensions arranged upon opposite sides of said bar and rigid therewith, and yielding supports for said bar secured transversely of said bar to said extensions and projecting in substantially the same direction therefrom, the longitudinal axis of said socket being perpendicular to the axis of oscillation of said bar.

13. In a sound box, the combination with a diaphragm, of a stylus bar having a stylus socket, rigid lateral extensions arranged upon opposite sides of said bar and rigid therewith, and yielding supports for said bar secured to said extensions and projecting in substantially the same direction therefrom, the longitudinal axis of said socket and the axis of oscillation of said bar being in the plane of the diaphragm.

14. In a sound box, the combination with a diaphragm, of a fixed member, a stylus bar spaced therefrom and provided with a stylus socket and spaced flat spring connections between the said fixed member and the stylus bar, said stylus bar being so arranged that the longitudinal axis of its outer end and its axis of oscillation are in the plane of the diaphragm.

15. In a sound box, the combination with a diaphragm, of a fixed member, a stylus bar spaced therefrom and provided with an offset and a stylus socket, and spaced flat springs connecting the said fixed member and said stylus bar, the longitudinal axis of said socket and the axis of oscillation of the said bar being in the plane of the diaphragm.

16. In a sound box, the combination with a diaphragm, of a fixed member, a stylus bar spaced therefrom and provided with an offset and with lateral extensions, and yielding connections extending toward the plane of the diaphragm between the said lateral extensions and the said fixed member, the axis of oscillation of said stylus bar being substantially in the plane of the diaphragm.

17. In a sound box, the combination with a diaphragm of a fixed member provided with a recessed edge, a stylus bar spaced therefrom and provided with an offset extending within said recess but spaced from said fixed member, said stylus bar being further provided with lateral extensions, and yielding connections between the said extensions and the said fixed member, the axis of oscillation of said stylus bar being substantially in the plane of the diaphragm.

18. In a sound box, the combination with a diaphragm, of a fixed member provided with a recessed edge, a stylus bar spaced

therefrom and provided with an offset extending within said recess but spaced from said fixed member, said stylus bar being further provided with lateral extensions, and resilient connections between the said extensions and the said fixed member, the axis of oscillation of the stylus bar being substantially in the plane of the diaphragm.

19. In a sound box, the combination with a diaphragm, of a fixed member, a stylus bar spaced therefrom and provided with an offset and with lateral extensions, and flat spring connections extending transversely of said bar and substantially perpendicular to the diaphragm between the said lateral extensions and the said fixed member, the axis of oscillation of said stylus bar being substantially in the plane with the diaphragm.

20. In a sound box, the combination with a diaphragm, of a fixed member, a stylus bar spaced therefrom and provided with an offset, and with a stylus socket, and lateral extensions, and yielding connections between the said lateral extensions and the said fixed member, the longitudinal axis of said socket and the axis of oscillation of said bar being substantially in the plane of the diaphragm.

21. The combination in a sound box of a diaphragm, a fixed member provided with a recessed edge, a stylus bar spaced therefrom and provided with an offset extended within said recess but spaced from said fixed member, said stylus bar being further provided with a stylus socket and lateral extensions, and yielding connections between said extensions and the said fixed member, the longitudinal axis of said socket and the axis of oscillation of said bar being substantially in the plane of the diaphragm.

22. The combination in a sound box of a diaphragm, a fixed member provided with a recessed edge, a stylus bar spaced therefrom and provided with an offset extended within said recess but spaced from said fixed member, said stylus bar being further provided with a stylus socket and lateral extensions, and yielding connections between said extensions and the said fixed member, the longitudinal axis of said socket and the axis of oscillation of said bar being substantially in the plane of the diaphragm, and said springs being arranged in a plane perpendicular to the plane of the diaphragm, and in a plane of the axis of oscillation of the stylus bar.

23. In a sound box, the combination of a stylus bar, a fixed member constructed of laminations to form spaced slots, and flat springs secured in said slots and to said stylus bar to form a support for said bar.

24. In a sound box, a fixed member, a stylus bar having extensions formed of laminations arranged to form slots, and spaced flat springs secured in said slots and con-

nected to said fixed member to support said bar.

25. In a sound box, a diaphragm, a stylus bar having one end thereof in acoustic contact with said diaphragm and spaced springs projecting in substantially the same direction substantially perpendicular to the diaphragm upon which said stylus bar is supported upon the sound box casing, said stylus bar being located substantially midway between said springs in a plane at right angles to the plane of the said springs, said springs being free to bend but held against torsion and said bar being restrained to oscillate upon a substantially fixed axis.

26. In a sound box, a diaphragm, a stylus bar having one end thereof in acoustic contact with said diaphragm, and spaced springs located on opposite sides of said stylus bar projecting in the same direction, upon which said stylus bar is supported upon the sound box casing, the said stylus bar being located in a plane at right angles to the plane of the said springs, said springs being free to bend but held against torsion and said bar being restrained to oscillate upon a substantially fixed axis.

27. The combination with a sound box, of a diaphragm, spaced springs connected with said casing and projecting in the same direction therefrom, and a stylus bar having one end thereof in acoustic contact with said diaphragm, said stylus bar having a stylus socket, and being mounted between and upon said springs, the longitudinal axis of said socket being at right angles to the axis of oscillation of said bar.

28. In a sound box, a stylus bar having a stylus socket, and spaced yielding members forming the sole support of said bar extending transversely of said bar, the longitudinal axis of the said socket being perpendicular to the axis of oscillation of the bar.

29. In a sound box, the combination with a fixed member, of a diaphragm, a stylus bar having a stylus socket, and spaced yielding members forming the sole support for said bar, the longitudinal axis of said socket and the axis of oscillation of the stylus bar being substantially in the plane of the diaphragm.

30. In a sound box, the combination with a fixed member, of a diaphragm, a stylus bar having a socket, and spaced yielding members forming the sole support for said bar, the longitudinal axis of the said socket and the axis of oscillation of the stylus bar being substantially in line with the plane of the diaphragm, and the longitudinal axis of the socket being in a plane perpendicular to the axis of oscillation.

31. In a sound box, a diaphragm, a stylus bar, having one end thereof in acoustic contact with said diaphragm and having a longitudinal stylus socket, spaced yielding

members projecting in the same direction from said stylus bar between which said stylus bar is located and upon which it is supported upon the sound box, the point of contact between the stylus bar and diaphragm and the axis of said socket being in alinement in a plane at right angles to the plane of the diaphragm, substantially midway between said springs.

32. In a sound box, the combination with a diaphragm, of a stylus bar phonetically connected thereto and provided with rigid lateral extensions, and spaced flat springs oblong in transverse section connected to said extensions and forming the sole support for said stylus bar, said bar being movable about a substantially fixed axis only.

33. In a sound box, the combination with a diaphragm, of a stylus bar phonetically secured thereto, and spaced spring members oblong in cross section and holding each other against torsion forming the sole support for said bar, said bar being movable about a substantially fixed axis only.

34. In a sound box, the combination with a fixed member, of a diaphragm, a stylus bar spaced from said fixed member and phonetically connected to said diaphragm, and spaced yielding members extending transversely of said bar and toward the plane of said diaphragm connecting said fixed member and said bar, said bar being movable about a substantially fixed axis only.

35. The combination with a rigid member, of a stylus bar, and yielding means connecting said stylus bar to said rigid member, said stylus bar being restrained to oscillate upon a substantially fixed axis.

36. The combination with a rigid member, of a stylus bar, and yielding means connecting said rigid member and said bar and forming the sole support for said bar, said bar being restrained to oscillate upon a substantially fixed axis.

37. The combination with a stylus bar, of spaced yielding members forming the sole support thereof, said members being free to bend but held against torsion and said bar being restrained to oscillate upon a substantially fixed axis.

38. The combination with a stylus bar, of spaced yielding members free to bend but held against torsion forming the sole support of said bar, and restraining said bar to oscillate upon a substantially fixed axis, each of said yielding members being fixed at one end and free to yield at its other end and connected at its free end to said stylus bar.

39. The combination with a sound box casing and a stylus bar, of yielding means for attaching said stylus bar to said casing, means mounted upon the casing for rendering one end of said yielding means rigid, means carried by the stylus bar for render-

ing the other end of said yielding means rigid, the said means for holding the ends of said yielding means rigid being spaced apart from each other for only a sufficient distance as will allow the said stylus bar to oscillate without effecting an actual engagement of said means for holding said ends rigid.

40. The combination with a stylus bar provided with rigid lateral extensions, of yielding members connected to said extensions and extending transversely of said extensions, forming the sole support for said stylus bar, said stylus bar being restrained to oscillate upon a substantially fixed axis.

41. The combination with a stylus bar provided with rigid lateral extensions, of yielding members connected to said extensions and extending transversely of said extensions, and transversely of said stylus bar forming the sole support for said stylus bar, said stylus bar being restrained to oscillate upon a substantially fixed axis.

42. The combination with a stylus bar, of a fixed member constructed of laminations to form space slots, and yielding members secured in said slots and to said stylus bar to form a support for said bar.

43. The combination with a stylus bar, of a member constructed of laminations to form a slot, and a yielding member secured in said slot and forming a support for said bar.

44. The combination with a stylus bar of spaced yielding members forming the sole support of said bar, said members being free to bend but held against torsion, and said bar being restrained to oscillate upon a substantially fixed axis.

45. The combination with a support, of a supporting member, attaching means detachably connecting said support, and said supporting member, yielding means, means independent of said attaching means for securing said yielding means to said support-

ing member, and a stylus bar secured to said yielding means.

46. The combination with a support, of a supporting member, attaching means detachably connecting said support and said supporting member, spaced yielding members, means independent of said attaching means for securing said yielding members to said supporting member and a stylus bar secured to said yielding members.

47. The combination with a member having a pair of spaced rigid arms rigid therewith, of a stylus bar projecting in the space between said arms and a yielding connection between each of said arms and said stylus bar.

48. The combination with a stylus bar, of spaced yielding members free to bend but held against torsion, each of said members being fixed at one end and free at its opposite end and said members being connected at their free ends to said stylus bar.

49. The combination with a stylus bar, of spaced yielding members free to bend but held against torsion, each of said members being fixed at one end and free at its opposite end and said members being connected at their free ends to said stylus bar forming the sole support of said bar.

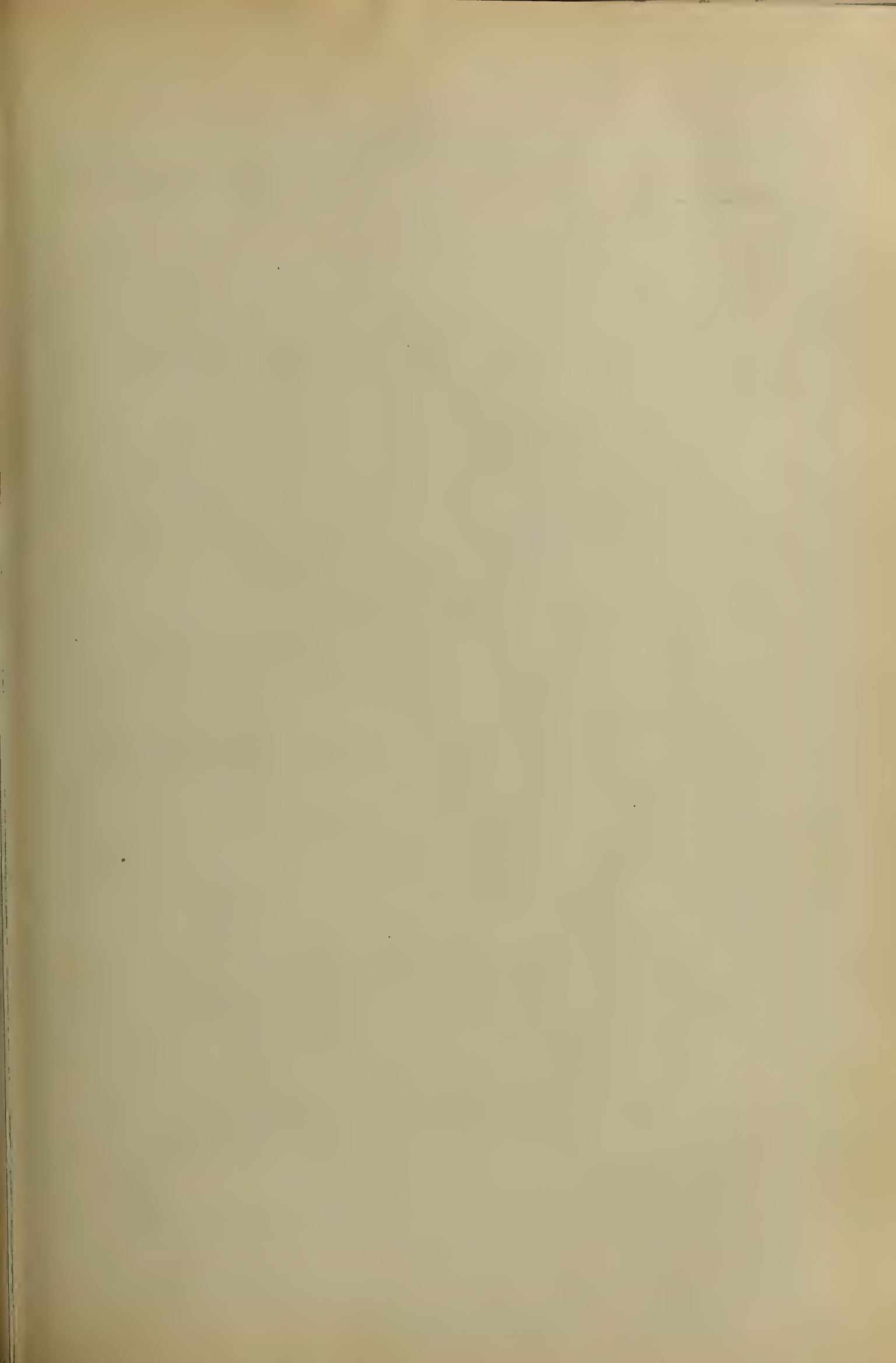
50. The combination with a stylus bar, of spaced yielding members free to bend but held against torsion, each of said members being fixed at one end and free at its opposite end and said members being connected at their free ends to said stylus bar forming the sole support of said bar and restraining said bar to oscillate upon a substantially fixed axis.

In witness whereof I have hereunto set my hand this seventh day of February, A. D. 1907.

ELDRIDGE R. JOHNSON.

Witnesses:

ALSTON B. MOULTON,
HARRY COBB KENNEDY.



C. VOGT.

TALKING MACHINE.

APPLICATION FILED MAR. 29, 1906.

951,158.

Patented Mar. 8, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

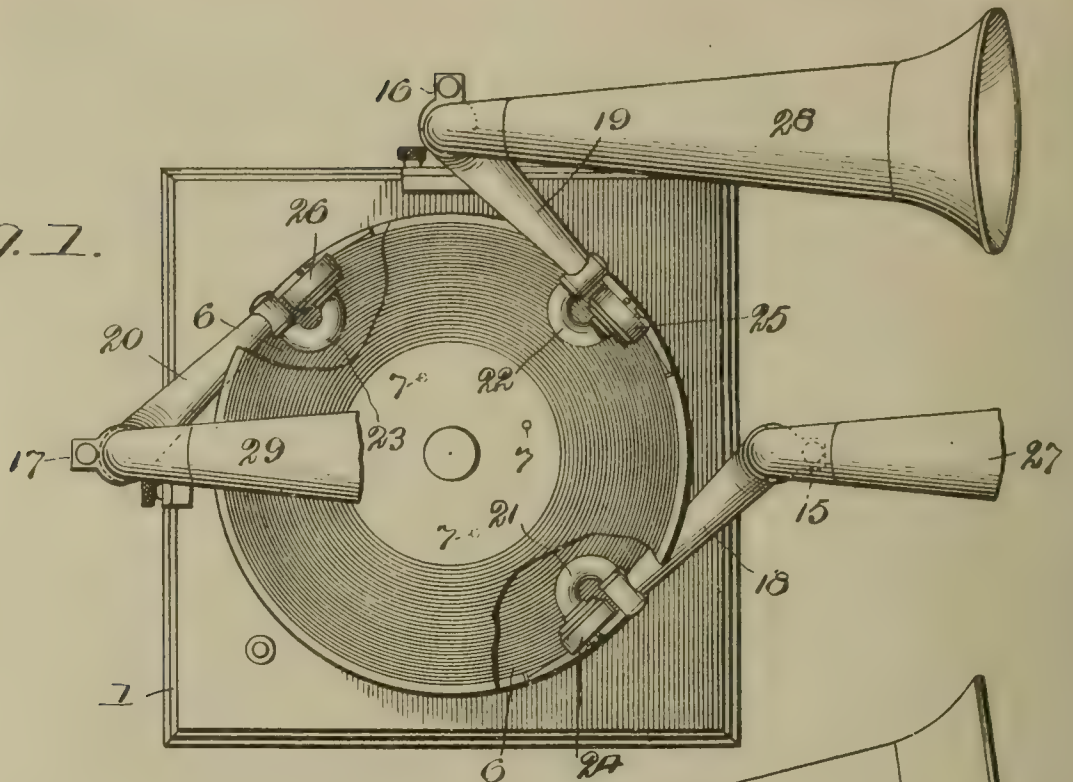
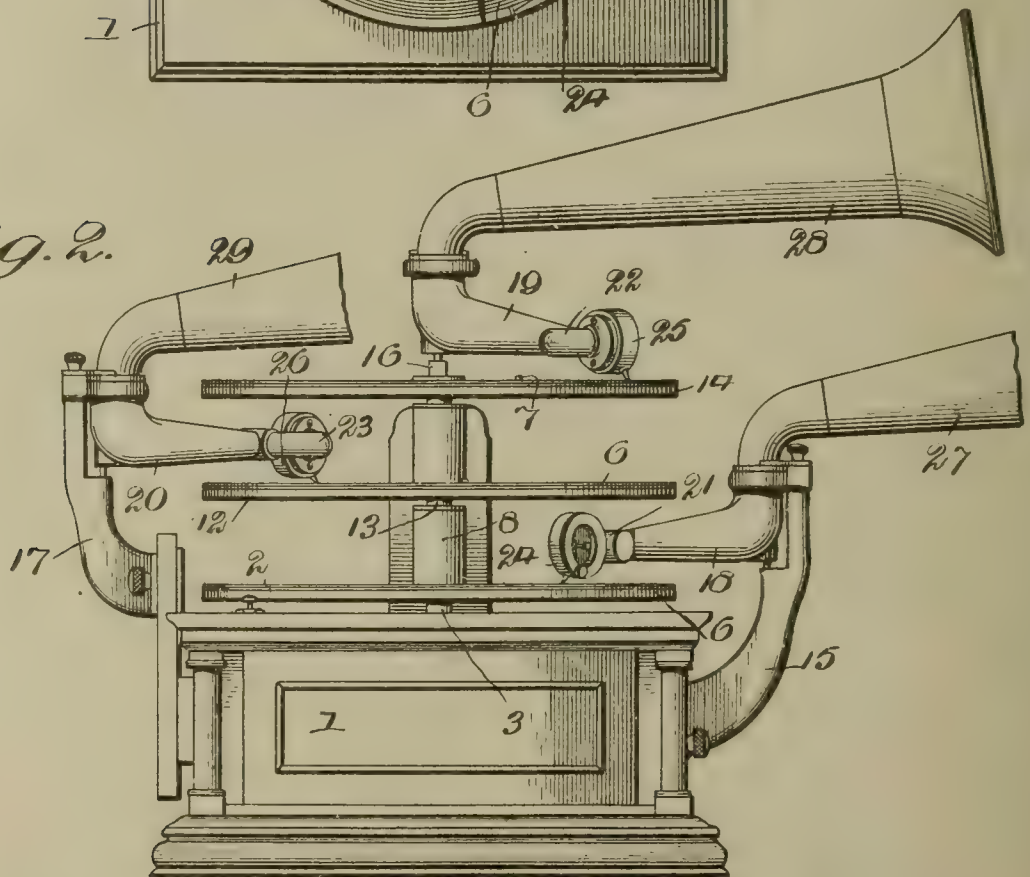


Fig. 2.



WITNESSES:

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INVENTOR:

Clarence Vogt

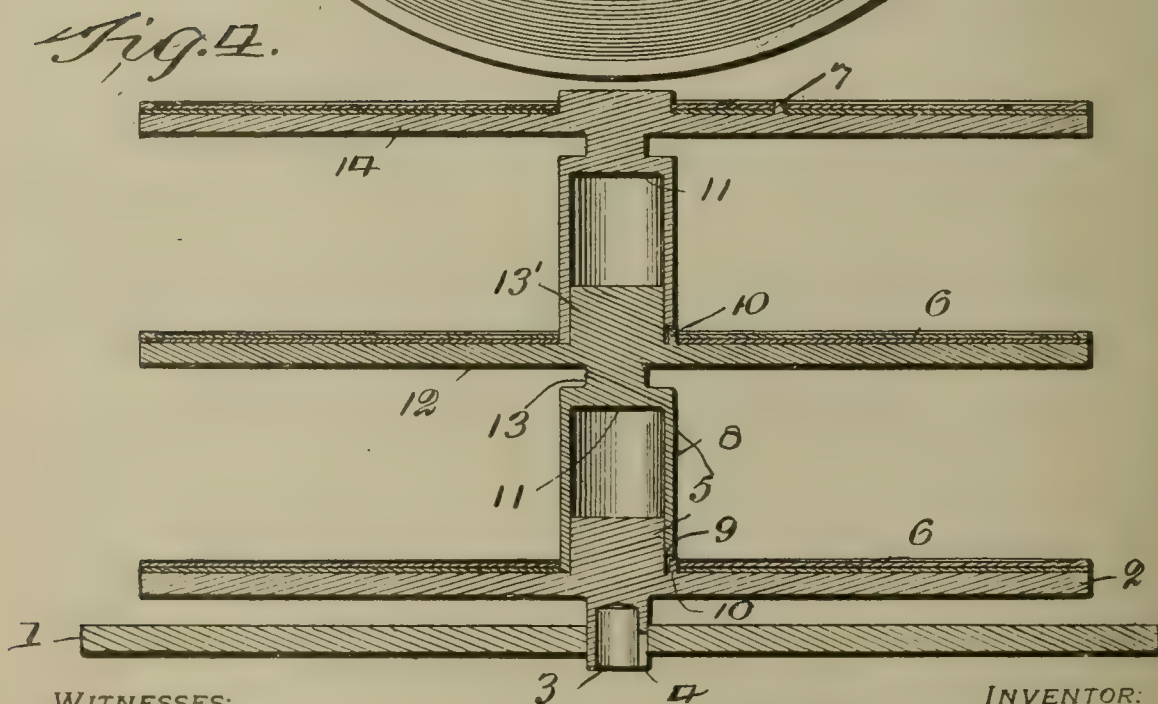
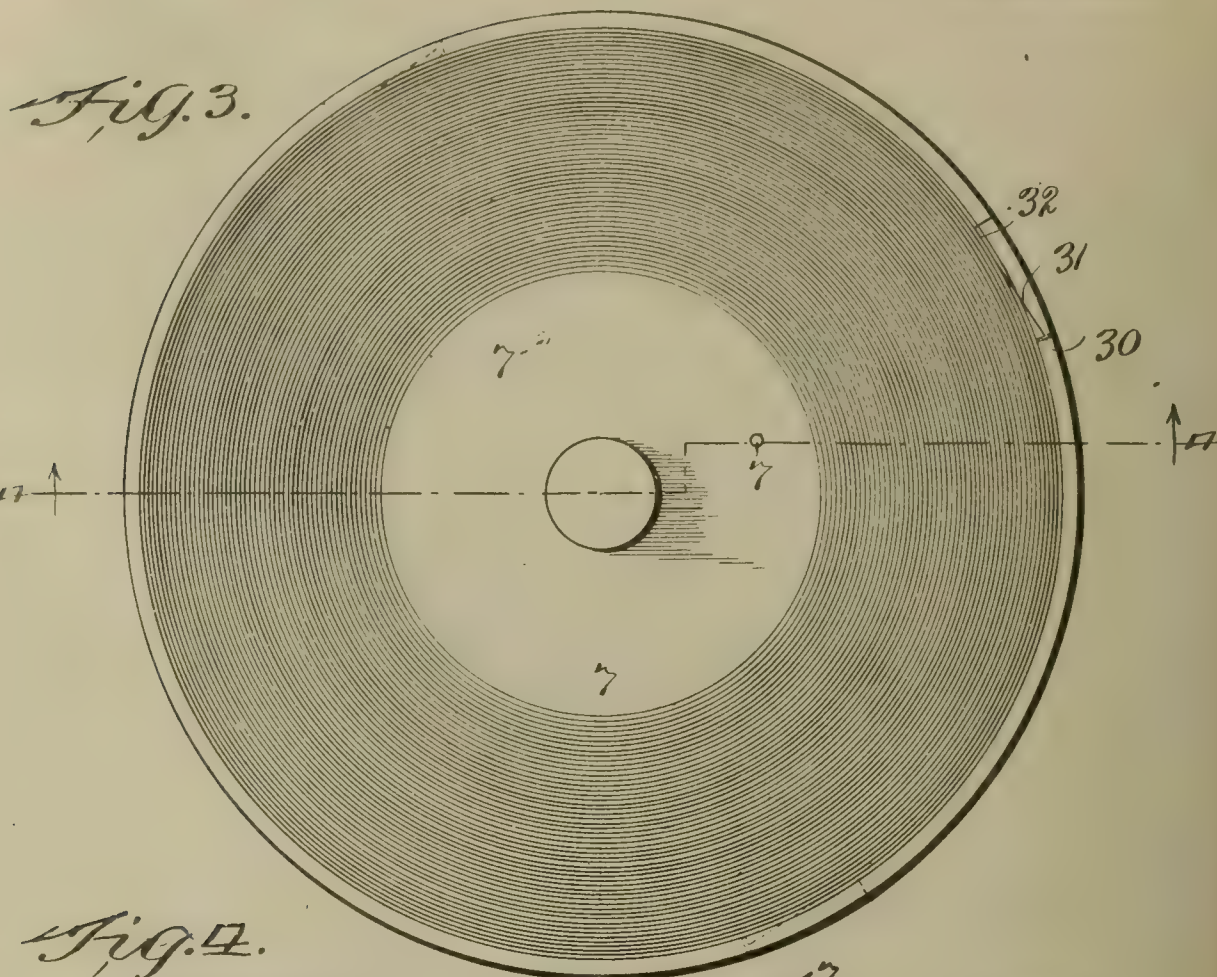
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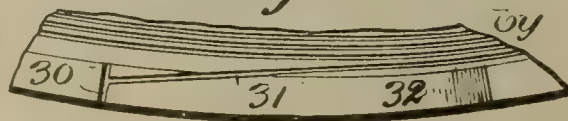
951,158.

Patented Mar. 8, 1910.
2 SHEETS—SHEET 2.



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Fig. 5.



INVENTOR:
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UNITED STATES PATENT OFFICE.

CLARENCE VOGT, OF BERLIN, GERMANY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

TALKING-MACHINE.

951,158.

Specification of Letters Patent.

Patented Mar. 8, 1910.

Application filed March 29, 1905. Serial No. 252,623.

To all whom it may concern:

Be it known that I, CLARENCE VOGT, a citizen of the United States, and a resident of the city of Berlin, Germany, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, clear, and complete disclosure.

One object of my invention is to provide an improved talking machine, having a plurality of record supports, each support being provided with sound reproducing means adapted to cooperate therewith.

A further object of my invention is also to produce such arrangement of parts in the talking machine above mentioned, that the records may be accurately placed upon the carrying mechanism, so that the parts of the reproducing mechanism may have the correct relation with each other to cause the sounds produced from the records to harmonize, and to combine the sound waves, to produce the most musical and pleasing effects.

A further object of my invention is to so construct the parts of the talking machine that the same may be played as a talking machine having a single disk or record, and also may be played as a talking machine comprising a plurality of disks without the necessity of radical changes in the machine, or the adjustment of delicate parts.

In the accompanying drawings Figure 1 is a top plan view of a talking machine constructed in accordance with this invention, parts of the record disks and turntables being broken away to show the reproducing mechanisms more clearly; Fig. 2 is a front elevation thereof; Fig. 3 is a plan view of a record as the same appears in position upon the turntable; Fig. 4 is a sectional view taken substantially upon the line 4—4, Fig. 3, showing three superposed turntables and records, and Fig. 5 is a detailed view showing one edge of a record adjacent the starting point of the record groove.

Referring to the drawings, one embodiment of this invention comprises a casing 1 which contains a suitable driving mechanism, or motor, for rotating the record carrier or turntables, said driving mechanism being of any of the well known or suitable construction, but somewhat larger and stronger than is ordinarily employed for driving a single record. A turntable 2 is rotatably mounted upon the casing 1 and is connected with the motor mechanism in any well known man-

ner, the connection in this case consisting of a cylindrical socket 3 having a slot 4 adapted to be engaged by a suitable key on the shaft or spindle of the driving mechanism, or motor. The center of the upper side of the turntable 2 is preferably provided with a boss or stud 5, which is adapted to pass through a suitable opening in the center of the record 6. Said record 6 is also provided with a hole through which a suitable pin 7, carried by the turntable 2 and projecting upwardly therefrom, is adapted to pass, to prevent the said record from moving in relation to the turntable. Each of the turntables hereinafter described is also provided with a pin similar to the pin 7, just described, for holding its respective record in a predetermined position.

Telescoping over the boss 5 of one turntable is a cylindrical sleeve or bushing 8 carried by the adjacent superimposed turntable, having a notch 9 in one edge thereof, which is adapted to register with, and engage, a pin or key 10 carried by the lower turntable adjacent the base of the boss 5. The upper end of the bushing 8 is preferably closed, as indicated at 11, and supports the next superimposed turntable 12 in any suitable manner, as by a cylindrical neck 13. This superimposed or second turntable 12 is provided with a boss 13' similar to the boss 5, of the supporting turntable 2, and also with the corresponding pin 7 and key 10. The third turntable 14 is a duplicate of the second, with the exception that the notch 9 and the pin 7 have different relative positions in relation to each other, and also with the exception that the central boss is made somewhat lower than the boss 13' unless it is intended to use a fourth record carrier.

Supposing now that the machine is to be constructed to operate three records playing in unison, three sides of the cabinet 1 are provided respectively with supports 15, 16, and 17, which are adapted to pivotally support three reproducing mechanisms 18, 19, and 20, respectively. These mechanisms are preferably of the tapering hollow arm type, but it is obvious that the construction of my machine is not limited to the use of the particular form of reproducing mechanism herein shown. The arms 18, 19, and 20 are preferably movable only parallel with the record, or record carrier, and are pro-

vided at their outer ends with curved tubes 21, 22, and 23, respectively, which are connected to sound boxes 24, 25, and 26, of any preferred form. The supports or brackets 5 15, 16, and 17 also form means for holding in position the usual amplifying horns 27, 28, and 29. For simplicity and economy in manufacture, the hollow arms 18, 19, and 20 are preferably made of the same length 10 and shape, their axes being so located in relation to the motor casing 1, and the axis of the record carriers, that each will occupy relatively the same position with respect to the path of its stylus over its record.

15 It will be obvious that since the notes or sounds produced by all the records must exactly harmonize, it is necessary that the styluses or needles pass over the same relative points in the record groove at any given 20 instant; that is, the vibrations produced by the sinuosities or undulations of each groove should have exactly the same relation to its corresponding needle or stylus at any given instant. To produce this result, I provide 25 the arrangement most clearly shown in Fig. 5. The edge or margin of the disk, or plate, is provided with a transverse groove, or nick, 30, transversely to which extends a groove 31, which is of substantially the same 30 size and shape in cross section as the record groove, and which communicates with the record groove, as indicated at 32. The transverse groove 30 must have a definite relation to the holes in the records through 35 which the pins 7 pass, and in this manner it will be seen that when the record disks are placed upon the turntables they will all have the correct positions, so that when the point of the styluses or needles are in posi- 40 tion for starting they will all rest in the short transverse grooves 30 of the respective records. The motor then being started the records will all revolve together, and each needle will have the same position in 45 relation to the record groove within which it is resting.

From this description it will be seen that I have produced a machine which will not only greatly multiply the sound reproduced 50 by a talking machine, but will make the same more harmonious and pleasing, owing to the softening and intermingling of the tones of the different records. Furthermore, it will be seen that by properly proportioning and adjusting the recording 55 mechanism from which the records are made, each of the records may be caused to represent a particular range of tone, so that when said records are reproduced the 60 record in which the bass notes have been more strongly recorded, will combine with the record in which the tenor, or other parts, have been more strongly recorded, which, in combination with one of the 65 higher parts, will give a result having much

greater range and more harmonious tones than could otherwise be produced. It will be obvious that it is also not necessary that the records should each be made from the same instrument, or set of instruments. The 70 same may be caused to represent different kinds of music, such as some records may contain vocal music, or songs, while others may contain the accompanying instrumental parts, which would thereby allow great va- 75 riety in the combinations of the parts of the selections reproduced.

Having thus described this form of my invention, what I claim and desire to protect by Letters Patent of the United States, 80 is—

1. In a talking machine, a plurality of reproducing mechanisms, a motor, and a series of turntables, said turntables each being provided with a projection and a cor- 85 responding socket by which the same may be successively superimposed to cause the same to be driven by said motor.

2. In a talking machine, a plurality of reproducing mechanisms, a motor, a plu- 90 rality of turntables comprising disks having sockets and projections on opposite sides thereof, said projections and sockets being adapted to engage each other to cause said turntables to be rotated by said motor, said 95 projections and sockets being provided with keys or similar devices for maintaining the correct relative positions of said turn-tables.

3. In a talking machine, the combination with a motor, of a plurality of record sup- 100 ports, and reproducing mechanism for each support, said supports being connected solely by means carried thereby.

4. In a talking machine, a plurality of reproducing mechanisms and a plurality of 105 turntables arranged one above the other, each comprising a disk having a downwardly extending central socket and an upwardly extending central stud or projec- 110 tion, the former engaging the stud on the disk below and the latter engaging the socket on the disk above.

5. In a talking machine, a plurality of reproducing mechanisms, a plurality of 115 turntables arranged one above the other, each comprising a disk having a downwardly extending central socket and an upwardly extending central stud or projection, the former engaging the stud on the disk 120 below and the latter engaging the socket on the disk above, and means for maintaining said studs and projections in rigid arrangement.

6. In a talking machine, a plurality of reproducing mechanisms, a plurality of 125 turntables arranged one above the other, each comprising a disk having a downwardly extending central socket and an upwardly extending central stud or projec- 130 tion, the former engaging the stud on the

disk below and the latter engaging the socket on the disk above, and means consisting of a slot and key for maintaining said studs and projections in rigid arrangement.

5 7. In a talking machine, the combination with a motor, of a plurality of record supports, one of said supports being driven by said motor, and carrying the remainder of said supports.

10 8. In a talking machine, the combination with a motor, of a plurality of record supports, one of said supports being driven by said motor, and carrying the remaining supports super-imposed thereon.

15 9. In a talking machine, the combination with a motor, of a plurality of record supports mounted to rotate upon the same axis, and a reproducing mechanism for each of said supports, one of said supports being
20 driven by said motor and driving and entirely supporting the remaining supports.

10. In a talking machine, the combination with a motor, of a series of turn tables, said
25 whereby one turn table may be super-imposed upon and carried by an adjacent turn table.

11. In a talking machine, a plurality of record supports being provided with means
30 whereby said supports may be super-imposed one upon the other in axial alinement.

12. In a talking machine, the combination with a motor, of a disk record support driven thereby, and a second similar record
35 support driven exclusively by said first mentioned support.

13. In a talking machine, the combination with a motor, of a record support driven thereby and a second support super-imposed
40 upon said first mentioned support in axial alinement with and driven thereby.

14. In a talking machine, the combination with a motor, of a record support driven thereby and provided with a stud projecting
45 centrally upon the upper side thereof, and a second record support provided with a sleeve upon the under side thereof fitting over said stud.

15. In a talking machine, the combination with a motor, of a record support driven thereby and provided with a stud project-
50 ing centrally upon the upper side thereof, and a second record support provided with a sleeve upon the under side thereof fitting over said stud, and reproducing mechanism
55 for each of said supports.

16. In a talking machine, the combination with a motor, of a turn table driven thereby, a turn table above said first turn table, and
60 means for connecting said turn tables whereby said first turn table carries said second turn table.

17. In a talking machine, the combination with a motor, of a turn table driven thereby,
65 a turn table above said first turn table, and

means for connecting said turn tables whereby said first turn table carries said second turn table, said means comprising a stud upon one turn table terminating between the turn tables, and a sleeve upon the other turn
70 table fitting over said stud.

18. In a talking machine, the combination with a turn table, of means to rotate the same, a second turn table, and means entirely
75 between said tables whereby said second table is rotated simultaneously with and solely by said first table.

19. In a talking machine, a plurality of record supports, each of said record supports being connected to an adjacent support solely
80 by means entirely between said supports.

20. In a talking machine, a plurality of rotary record supports, one of said supports being entirely carried by another of said supports, and said supports being held
85 against rotation with respect to each other but being freely separable.

21. In a talking machine, a plurality of concentric rotary record supports, one of said record supports being entirely sup-
90 ported by an adjacent record support, and said supports being held against rotation with respect to each other but being freely separable longitudinally of their axis of rotation.

22. A record support for talking machines, said support having means carried thereby, whereby said support may be connected to a similar support, and whereby said second
100 support may be entirely carried by said first mentioned support.

23. A record support for talking machines, having a stud on one side and a sleeve on the opposite side for detachably connecting said support between two similar supports.
105

24. In a talking machine the combination with a motor, of a plurality of disk record supports, and a reproducing mechanism for each of said supports, one of said supports being driven by said motor and driving the
110 remaining supports.

25. In a talking machine the combination with a motor, of a plurality of disk record supports mounted to rotate about the same axis, and a reproducing mechanism for each
115 of said supports, one of said supports being driven by said motor and driving the remaining supports.

26. In a talking machine, a plurality of record supports provided with means where-
120 by said supports may be superimposed one upon the other and whereby each support will be held against rotation with respect to its adjacent support.

27. A record support for a talking ma-
125 chine, said record support comprising means projecting in opposite directions therefrom whereby said support may be connected between two similar supports and held against rotation with respect thereto, and whereby
130

one of said supports will form the sole support of said first mentioned support.

28. In a talking machine, a disk record support having a stud projecting upwardly and centrally therefrom for the attachment of a second support.

29. A record support for a talking machine, said support being provided with a stud projecting from one side thereof, and a corresponding sleeve projecting from the other side thereof whereby said support may be connected between two similar supports.

30. In a talking machine, a disk record support having a stud projecting upwardly and centrally therefrom for the attachment of a second support, and a sleeve projecting centrally from the opposite side of the said support for the attachment of said support to a motor spindle.

31. In a talking machine the combination with a reproducing mechanism, of a record therefor, said record having a main groove and a starting groove having a definite indicating means at the point of commencement of the starting groove, and means for holding said record in a predetermined relation to said reproducing mechanism, said means having a definite position in relation to said point of commencement of said starting groove.

32. In a talking machine the combination with a plurality of reproducing mechanisms, of records therefor, each record being provided with a main groove, and a starting groove having a transverse groove leading into said starting groove adjacent the point of commencement thereof, and means for holding each record in a predetermined relation to its corresponding reproducing mechanism, said means having a definite position in relation to said point of commencement of said starting groove.

33. In a talking machine, the combination with a motor, of a plurality of record supports, and reproducing mechanism for each support, one of said supports being entirely supported by another of said supports.

34. In a talking machine, the combination with a plurality of reproducing mechanisms, of a motor, and a plurality of record supports, each of said supports being provided with means whereby the same may be superimposed in axial alinement to be driven by said motor.

35. In a talking machine, the combination with a plurality of reproducing mechanisms, of a motor, and a plurality of record supports, each of said supports being provided with a projection and a corresponding socket, the projection of one support fitting snugly in the socket of an adjacent support.

36. In a talking machine, a plurality of record supports, each of said supports being provided with a stud, and a corresponding socket, the stud of one support fitting snugly

in the socket of a second support for connecting said supports.

37. The combination with a record support for talking machines, of means carried thereby, whereby said support may be connected to a second support and whereby said second support may be entirely carried by, and held against rotation with respect to, said first mentioned support.

38. The combination with a disk record support for talking machines, of means carried thereby and projecting axially therefrom whereby said support may be connected to a second similar record support, and whereby said second support may be entirely carried by said first support, said second support being movable axially with respect to said first support, but being held against rotation with respect thereto.

39. A record support for talking machines, having a stud for detachably connecting said support to a second support.

40. A record support for talking machines, having a stud and a socket for detachably connecting said support between two other supports.

41. A record support for talking machines, having a stud and a corresponding socket for detachably connecting said support between two similar supports.

42. In a talking machine, a plurality of rotary record supports, one of said supports entirely supporting and rotating the remaining supports.

43. In a talking machine, the combination with a motor, of a record support driven thereby, and a second similar record support driven by said first mentioned support.

44. In a talking machine, the combination with a motor, of a disk record support driven thereby, and a second disk record support driven by said first mentioned support.

45. In a talking machine, the combination with a motor, of a record support driven thereby, and a second record support in axial alinement with said first mentioned support and driven exclusively thereby.

46. In a talking machine, the combination with a motor, of a plurality of record supports, and a reproducing mechanism for each of said supports, one of said supports being driven by said motor and driving and entirely supporting the remaining supports.

47. In a talking machine, the combination with a motor, of a record support driven thereby, a second record support driven and carried exclusively by said first mentioned support, and reproducing mechanism for each of said supports.

48. In a talking machine, the combination with a motor, of a record support driven thereby, a second record support entirely supported by said first mentioned support and driven thereby, and a reproducing mechanism for each of said supports.

49. The combination with a record support for talking machines, of a second record support, and means carried by said first mentioned support, whereby said support is connected to said second support, and whereby
5 said second support is entirely carried by, and held against rotation with respect to, said first mentioned support.

50. The combination with a disk record
10 support for talking machines, of a second record support similar to said first mentioned support, and means carried by said first support and projecting axially therefrom,

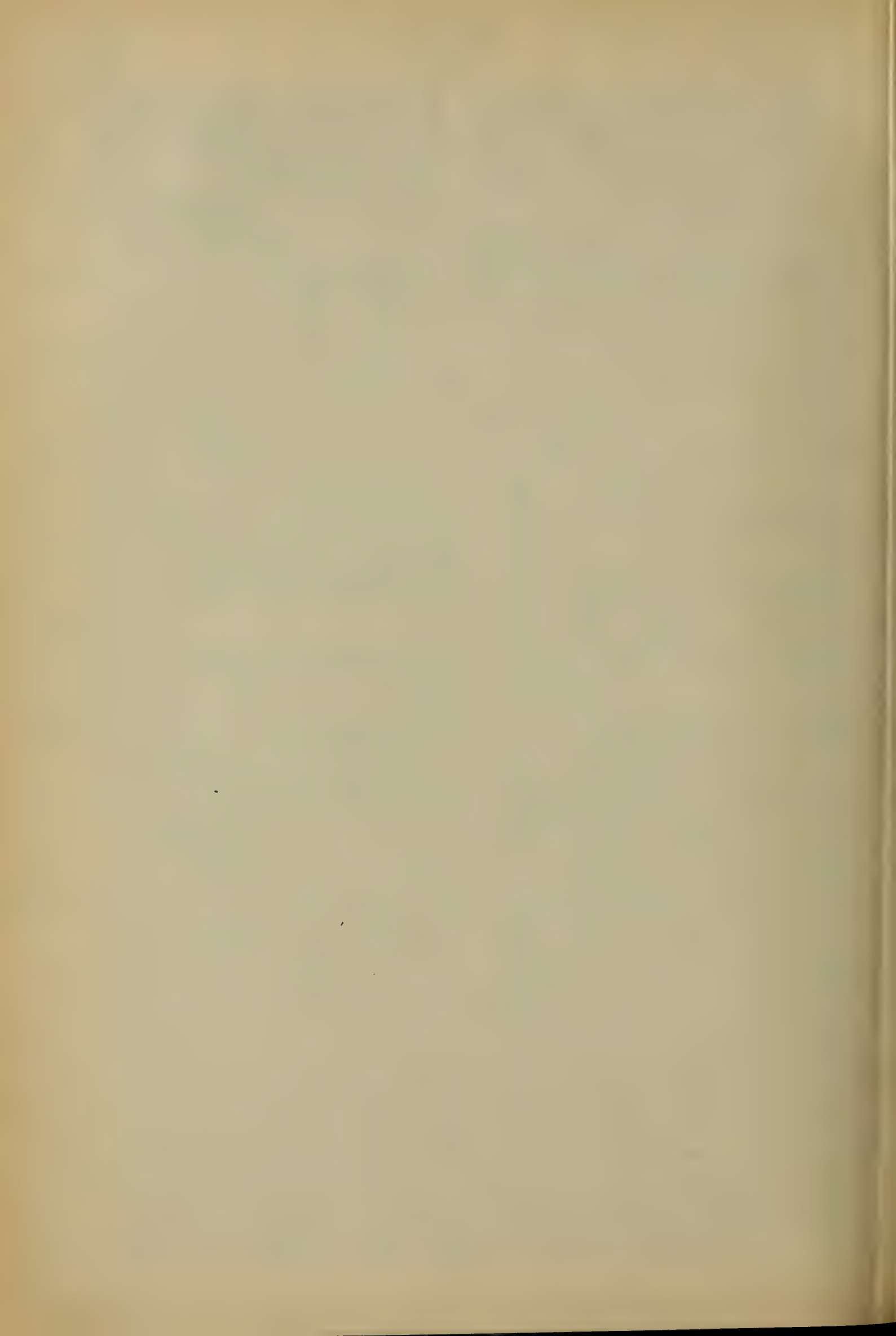
whereby said first support is connected to said second support, and whereby said second support is entirely carried by said first support, said second support being movable axially but being held against rotation with respect to said first support.

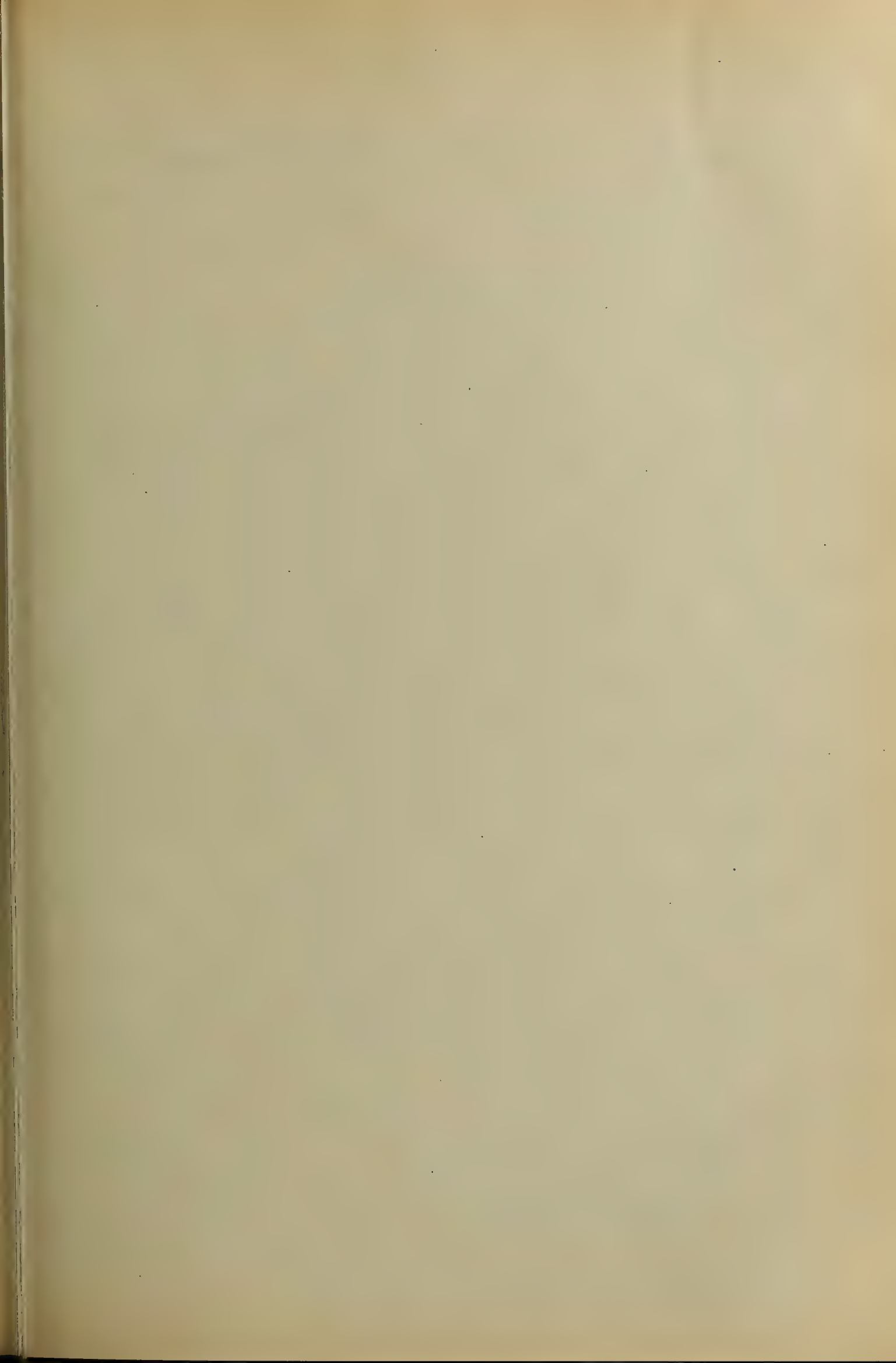
In witness whereof, I have hereunto set
my hand this eleventh day of March, 1905.

CLARENCE VOGT.

Witnesses:

THEO. BIRNBAUM,
HENRY HASPER.





E. C. SMITH.

SOUND BOX.

APPLICATION FILED MAY 27, 1901.

951,292.

Patented Mar. 8, 1910.

Fig.1

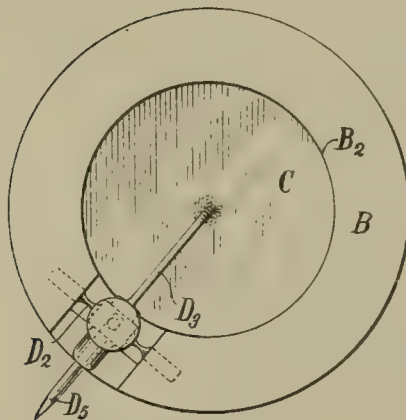


Fig.2

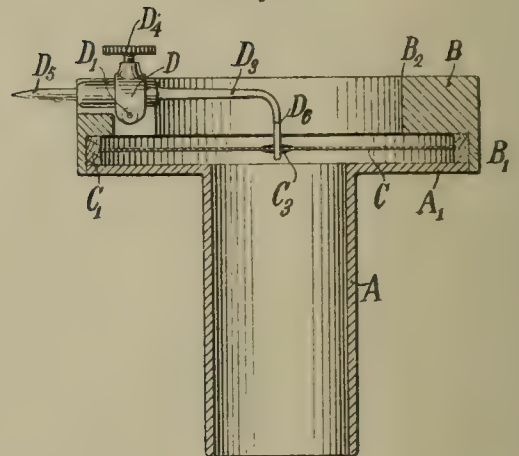


Fig.3

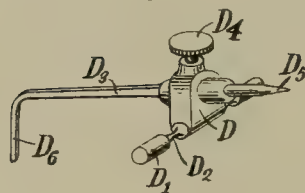
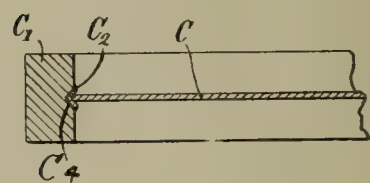


Fig.4



Witnesses:

Raphaël Heller
Alexander Mitchell

Inventor

Eugene C. Smith

by

Frederick S. Duncan, Att'y

UNITED STATES PATENT OFFICE.

EUGENE C. SMITH, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO
VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-BOX.

951,292.

Specification of Letters Patent.

Patented Mar. 8, 1910.

Application filed May 27, 1901. Serial No. 62,021.

To all whom it may concern:

Be it known that I, EUGENE C. SMITH, a citizen of the United States, residing in the city of New York, county and State of New York, have invented certain new and useful Improvements in Sound-Boxes, of which the following is a specification.

The main objects of this invention are, to provide an improved sound box for talking machines; to provide an improved casing for a sound box; to provide an improved mounting for a stylus bar; to provide an improved mounting for a diaphragm; to provide an improved connection between a stylus bar and a diaphragm; and to provide other improvements as will appear hereinafter.

In the accompanying drawings Figure 1 is a front elevation of a sound box constructed in accordance with this invention; Fig. 2 a longitudinal axial section of the same; Fig. 3 a perspective view of a portion of the same; and Fig. 4 a fragmentary axial sectional view of a portion of the same.

Referring to the drawings, one embodiment of this invention comprises a hollow casing preferably made of metal or other heavy material and having a cylindrical transmitting tube A open at both ends and adapted to communicate through its outer end with the usual sound amplifier of a talking machine and surrounding the inner end of this tube, integral and coaxial therewith is a flat annular plate A¹, forming the back of the casing. Telescoping tightly over this back plate A¹ is a cylindrical cap or shell B having a cylindrical bore B² and provided upon its outer or front end with a relatively thick and heavy inwardly extending flat annular flange forming the face of the casing, the flange being coaxial with the cap B and the transmitting tube A. These two tightly telescoping sections A and B of the casing may be secured together by any suitable means, for instance by shellac, filling the joint between these two parts. The annular groove or recess bounded by the inside flat annular surface of the back plate A¹, the opposite inside flat annular surface of the flange of the cap B, and the cylindrical surface of the bore of the cap constitutes the diaphragm chamber. The flange of the cap

B is made unusually thick and heavy and extends inwardly farther than has heretofore been usual for purposes hereinafter explained.

For mounting a diaphragm in the diaphragm chamber, a cylindrical ring or diaphragm support C¹ is fitted snugly but removably within the cylindrical bore B¹ of the cap B. This ring is rectangular in cross section, completely filling the outer portion of the diaphragm chamber, the end walls of the ring being in contact with and clamped between the inner flat walls of the front and back respectively of the casing. An internal annular groove or depression C⁴ is provided in the cylindrical bore of the ring in a plane perpendicular to the axis of the ring substantially midway between the end edges of the ring. Within this groove C⁴ is an annular layer of rubber cement or other yielding material C² within which is supported a diaphragm C, preferably made of thin mica or other flexible material. The diaphragm normally rests in a plane perpendicular to the axis of the casing of the sound box and is spaced midway between the flat annular walls forming the ends of the diaphragm chamber. The ring C¹ is preferably formed of thoroughly seasoned wood and is rendered proof against distortion by suitable treatment, such as by being varnished with shellac, and also if desired, by being held inclosed by a binding metallic rim secured to the edge of the same.

In mounting the diaphragm, after the ring or support C is formed, a layer or ring of rubber cement, made in a well known manner of pure gum and any suitable solvent, such as carbon bisulfid, or any other similar cement, is placed in the internal groove C⁴ of the support. When this cement has solidified slightly, but while it is still soft and plastic, the diaphragm, the diameter of which is preferably slightly greater than the internal diameter of the cylindrical bore of the ring, and slightly less than the diameter of the groove therein, is sprung into the ring of cement by pressing the center of the diaphragm, to reduce its diameter. The periphery of the diaphragm is then placed in proper position and the diaphragm is then released and its

peripheral edge springs outwardly and engages the soft rubber cement forming an internal groove therein and permitting the diaphragm to assume its normal configuration. The diaphragm is thus held with substantially the same force throughout its whole extent and any distortion or unsymmetrical constraint of the diaphragm is avoided. When the diaphragm is thus mounted it contacts at its peripheral edge substantially only, with the rubber cement by which it is supported, the walls of the groove in the cement sloping from the peripheral edge of the diaphragm away from the sides of the diaphragm. This rubber cement remains sufficiently elastic to permit the diaphragm to yield readily radially in its own plane or in any other direction with respect to its supporting ring, and since the diaphragm is flexible and as the plane surface or sides of the diaphragm are not in contact with the cement, the diaphragm is free to flex or vibrate in a direction transversely of its plane throughout its whole extent.

A stylus bar comprising a main portion D is mounted upon a torsional resilient rod D¹ in a recess provided therefor in the front of the sound box casing. The torsional rod D¹ is soldered or otherwise rigidly secured at its two ends as shown in Fig. 1 to the cap B of the sound box casing and the central portion of the rod is likewise rigidly secured to the main portion D of the stylus bar, the rod forming two torsional spaced arms extending in opposite directions from the stylus bar and forming the sole support thereof. Upon each side of the stylus bar the torsional rod is reduced in diameter between the stylus bar and the cap forming two comparatively short slender portions D², as shown in Figs. 1 and 3. These reduced portions D² are circular in cross section and are preferably only about 1/100 of an inch in smallest diameter so that they offer little resistance to the oscillation of the stylus bar about the longitudinal axis of the rod, but at the same time, by reason of their shortness and spaced arrangement, the stylus bar is held thereby substantially rigid against any other movement. The axis of oscillation of the bar, which coincides with the longitudinal axis of the rod D¹ is substantially parallel to the plane of the diaphragm and is between the diaphragm and the front surface of the sound box casing.

The main portion D of the stylus bar has a hollow lug projecting outwardly therefrom radially of the sound box forming a stylus socket in which is carried the usual stylus or needle D⁵, held in position by the usual retaining screw D⁴, threaded through the outer part of the main portion of the bar and engaging against the upper end of the needle.

Extending radially inwardly from the main portion D of the stylus bar and rigidly secured thereto is an arm D³ the inner end D⁶ of which is turned toward the diaphragm, and projects slightly through a suitable opening in the center thereof. This end D⁶ of the stylus bar may be secured to the diaphragm by any suitable means, but preferably by a celluloid cement formed of celluloid dissolved in any suitable solvent. The elasticity of the cement allows sufficient play between the diaphragm and the stylus bar so that the diaphragm will not be distorted by the oscillation of the bar, but still enables the bar to transmit perfectly the sound vibrations which it is desired to impress upon the diaphragm. The diaphragm and stylus bar are so mounted and connected that normally no pressure is exerted by the bar upon the diaphragm.

This sound box is adapted to be operated in the usual well known manner by being mounted in communication with a horn or sound amplifier, to permit the needle D⁵ carried by the box to be actuated by the usual sound record which is revolved relatively thereto. In this operation the record communicates in general, two sets of movements to the stylus bar, first the true sound vibrations, which it is desired to transmit to the diaphragm, and second the surgings, as they may be called, in a direction transverse to the sound vibrations. These surgings are due to the inaccuracies of the record and should not be transmitted to the diaphragm.

By having the stylus mounted as heretofore described, so that it will oscillate freely in a plane perpendicular to the diaphragm, when in operation, in response to the undulations of the record corresponding to sound waves, upon an axis substantially fixed with respect to the sound box, and so that it will be held substantially rigid against movement in any other direction, only the true sound vibrations of the stylus bar will be transmitted to the diaphragm. Furthermore by mounting the stylus bar upon a resilient torsional rod having reduced portions as described, the reduced portions of the rod exert a slight torsional effect upon the stylus bar in operation, tending to restore the bar to its normal position after it has been deflected and to cause the vibrations of the diaphragm to be symmetrical with respect to its normal central position.

The sound box casing is preferably made comparatively heavy, as heretofore described, by making the flange of the cap B unusually heavy, to give it sufficient inertia to remain substantially unaffected by the vibrations of the stylus bar and diaphragm, corresponding to sound waves, but the casing is not made so heavy that the slow surgings transmitted to the stylus bar by the imperfections of the record will not readily overcome the inertia

of the box and permit the box to follow these surging without placing any undue stress upon the delicate parts of the box or upon the record.

5 The improved mounting above described for the diaphragm has proved very advantageous in practice, since it permits of a greater freedom of movement of the diaphragm than is possible when the diaphragm is clamped between two rubber rings and held against radial movement, as heretofore has been the practice; and it has been found, furthermore, that this mounting is very effective in reducing the metallic quality which has heretofore been noticeable in the reproduction of vocal sounds.

By having the diaphragm mounted substantially midway between and parallel to the inner parallel annular walls of the front and back of the sound box casing, an annular recess is formed on each side of the diaphragm and the pressure of the air in the recess upon the outer side of the diaphragm acts to counterbalance the pressure of the air in the recess upon the inner side of the diaphragm when the diaphragm is in operation, and results in a more uniform and symmetrical action on the part of the diaphragm in response to the vibration of the stylus bar, whereby the quality of the reproduction is improved.

Although only a single form has been shown in which this invention may be embodied, it is desired to have it distinctly understood that the invention is not limited to the single construction shown. Instead of the torsional mounting shown and described for the stylus bar, any other suitable mounting might be employed. Furthermore, parts of this invention might be employed without using other parts. These, and other changes might be made in the construction described without departing from the spirit of this invention of the scope of the appended claims.

45 Having thus described my invention, I claim and desire to protect by Letters Patent of the United States:

1. In a sound box, the combination with a casing having spaced walls, of a diaphragm between said walls and restrained at substantially its peripheral edge only.

2. In a sound box, the combination with a casing having two substantially parallel spaced walls, of a diaphragm substantially parallel to said walls restrained at its peripheral edge only, substantially midway between said walls.

3. In a sound box, the combination with a support, of a diaphragm, movable in its own plane with respect thereto.

4. In a sound box, the combination with a support, of a diaphragm movable in its own plane, and a stylus bar connected to said diaphragm and mounted to oscillate in a plane transverse to the plane of the diaphragm.

5. The combination with a diaphragm, of means contacting with the peripheral edge only of said diaphragm, forming the sole support of said diaphragm.

6. The combination with a diaphragm, of yielding means contacting with the peripheral edge only of said diaphragm forming the sole support of said diaphragm.

7. The combination with a diaphragm, of resilient means contacting with the peripheral edge only of said diaphragm, forming the sole support of said diaphragm.

8. In a sound box, the combination with a support, of a diaphragm, and means between said support and the peripheral edge only, of said diaphragm, to support said diaphragm.

9. In a sound box, the combination with a support, of a diaphragm, and yielding means between said support and the peripheral edge only, of said diaphragm, to support said diaphragm.

10. In a sound box, the combination with a support, of a diaphragm, and elastic cement for yieldingly connecting the said diaphragm to said support.

11. In a sound box, the combination with a removable support having a recess, of a diaphragm having its edge in said recess, and yielding means to hold said diaphragm in position.

12. In a sound box, the combination with a removable support having a recess, of a diaphragm having its edge in said recess, and elastic cement to hold said diaphragm yieldingly in position.

13. In a sound box, the combination with a support, having a recess, of a diaphragm having its edge in said recess, and means between the peripheral edge only of said diaphragm and said support, to support said diaphragm.

14. In a sound box, the combination with a support, having a recess, of a diaphragm having its edge in said recess, and yielding means between the peripheral edge only of said diaphragm and said support to support said diaphragm.

15. In a sound box, the combination with a yielding ring, of a diaphragm contacting at its peripheral edge only with said ring.

16. In a sound box, the combination with a yielding ring, of a diaphragm contacting at its peripheral edge only with said ring, and entirely supported thereby.

17. The combination with a ring, of a diaphragm, and means, interposed between said ring and said diaphragm, forming the sole support of said diaphragm.

18. The combination with a ring, of a diaphragm and yielding means, interposed between said ring and said diaphragm, forming the sole support of said diaphragm.

19. The combination with a ring, of a diaphragm, and means contacting with said

ring, and substantially only with the peripheral edge of said diaphragm, forming the sole support of said diaphragm.

20. The combination with a ring, of a diaphragm, and yielding means contacting with said ring, and with substantially only the peripheral edge of said diaphragm, forming the sole support of said diaphragm.

21. The combination with a yielding ring having an internal annular groove, of a diaphragm having only its peripheral edge in contact with said ring in said groove, the side walls of said groove being inclined away from the sides of said diaphragm.

22. The combination with an integral ring having an internal annular groove, of a diaphragm slightly greater in diameter than the internal diameter of said ring and slightly less in diameter than the diameter of said groove supported in said groove, and yielding means between said diaphragm and the wall of said groove, to hold said diaphragm yieldingly in position.

23. The combination with a stylus bar, of a mounting therefor comprising a torsional member.

24. The combination with a stylus bar, of a mounting therefor comprising a resilient torsional member.

25. The combination with a stylus bar, of a mounting therefor, comprising a torsional member forming the sole support for said bar.

26. The combination with a stylus bar, of a mounting therefor comprising a resilient torsional member forming the sole support for said bar.

27. The combination with a stylus bar, of a mounting therefor, comprising a torsional member rigidly secured to the bar.

28. The combination with a stylus bar, of a mounting therefor, comprising a torsional member rigidly secured to the bar, and extending in opposite directions therefrom, forming spaced yielding arms.

29. The combination with a stylus bar, of a mounting therefor comprising spaced yielding arms.

30. The combination with a stylus bar, of a mounting therefor, comprising spaced yielding arms forming the sole support of said bar.

31. The combination with a stylus bar, of a mounting therefor comprising spaced yielding arms extending in opposite directions from the bar.

32. The combination with a stylus bar, of a mounting therefor comprising spaced yielding arms extending in opposite directions from the bar and forming the sole support thereof.

33. The combination with a stylus bar, of a mounting therefor comprising spaced resilient arms.

34. The combination with a stylus bar, of

a mounting therefor comprising spaced resilient arms forming the sole support of said bar.

35. The combination with a stylus bar, of a mounting therefor comprising a torsional member having a reduced portion to permit of the free oscillation of the bar.

36. In a sound box, the combination with a casing, of a stylus bar and a torsional member fixed to said casing and to said bar.

37. In a sound box, the combination with a casing, of a stylus bar and a torsional member fixed to said casing and to said bar, and forming the sole support of said bar.

38. In a sound box, the combination with a casing, of a stylus bar and a yielding member having its intermediate portion fixed to said bar and its ends fixed to said casing.

39. In a sound box, the combination with a casing, of a stylus bar, and a resilient member having its intermediate portion fixed to said bar and its ends fixed to said casing.

40. In a sound box, the combination with a casing, of a stylus bar and a torsional member having its intermediate portion fixed to said bar and its ends fixed to said casing.

41. In a sound box, the combination with a casing, of a stylus bar, and a torsional rod having its intermediate portion fixed to said bar and its ends fixed to said casing forming the sole support of said bar, said rod being reduced in diameter between said bar and said casing upon each side of said bar.

42. In a sound box, the combination with a diaphragm, of a stylus bar mounted to oscillate and a yielding connection between said diaphragm and said bar.

43. In a sound box, the combination with a diaphragm, of a stylus bar mounted to oscillate and celluloid cement connecting said diaphragm to said bar.

44. In a sound box, the combination with a diaphragm, of a support therefor comprising means applied to said diaphragm in a plastic condition.

45. In a sound box, the combination with a diaphragm of a wooden support therefor, and a yielding connection between said diaphragm and said support.

46. In a sound box, the combination with a wooden ring having an annular internal recess, of a diaphragm in said ring, and rubber cement in said groove supporting said diaphragm.

47. A sound box comprising a casing, a ring removably clamped in said casing and a flexible diaphragm permanently secured to said ring by a film of flexible cement to allow said diaphragm to move radially with respect to said ring.

48. In a sound box, the combination with a removable ring, of non-elastic material mounted within said sound box made in one

piece, and having an interior groove, and a diaphragm having its peripheral portion seated in said groove, confined between the side walls thereof, and elastically supported therein.

49. The combination in a sound box of a removable ring of non-elastic material having an interior groove and mounted within said sound box and a diaphragm having its peripheral portion situated in said groove and loosely confined between the side walls thereof.

50. The combination in a sound box, of a removable ring having an interior groove mounted within said sound box and a diaphragm having its peripheral portion situated in said groove and loosely confined between the walls thereof.

51. A support for a diaphragm of a sound box consisting of a ring of non-elastic material adapted to be mounted within a sound box, made in one piece and having an interior groove and a diaphragm having its peripheral portion permanently situated in said groove and loosely confined between the side walls thereof.

52. A support for a diaphragm of a sound box, consisting of a ring having a groove and adapted to be mounted within a sound box and a diaphragm having its peripheral portion permanently situated in said groove and loosely confined between the walls thereof.

53. A diaphragm support having a groove, and adapted to be mounted within a sound box and a diaphragm having its peripheral portion permanently situated in said groove, loosely confined between the side walls thereof and elastically supported therein.

54. A diaphragm support having a recess therein, a diaphragm fitting in said recess

and elastic means securing said diaphragm to said support.

55. In a sound box for reproducing and recording sound waves, the combination of a ring having its interior surface formed of different diameters in different parallel planes but the same in cross section throughout its circumference, with a thin layer of yielding material within the ring and in contact with its surface of larger diameter, and a diaphragm having its extreme perimeter formed into retaining engagement with the ring, through the yielding material, for holding the diaphragm only at its perimeter and leaving its faces free and unobstructed.

56. In a sound box, the combination with a casing comprising two separate parts forming an annular internal groove, of a diaphragm, and an annular mounting for said diaphragm in said groove, said mounting being substantially rectangular in cross section and being equal in width and diameter to the width and diameter of said groove.

57. In a sound box, a diaphragm, a support therefor, said diaphragm being mounted in said support by its edge substantially only.

58. In a sound box, the combination of a diaphragm, of a mounting therefor, and a permanently yielding material between the peripheral edge of said diaphragm and said mounting to hold said diaphragm in place.

59. In a sound box, the combination with a diaphragm, of a mounting therefor, and a permanently resilient material between the peripheral edge of said diaphragm and said mounting to hold said diaphragm in place.

EUGENE C. SMITH.

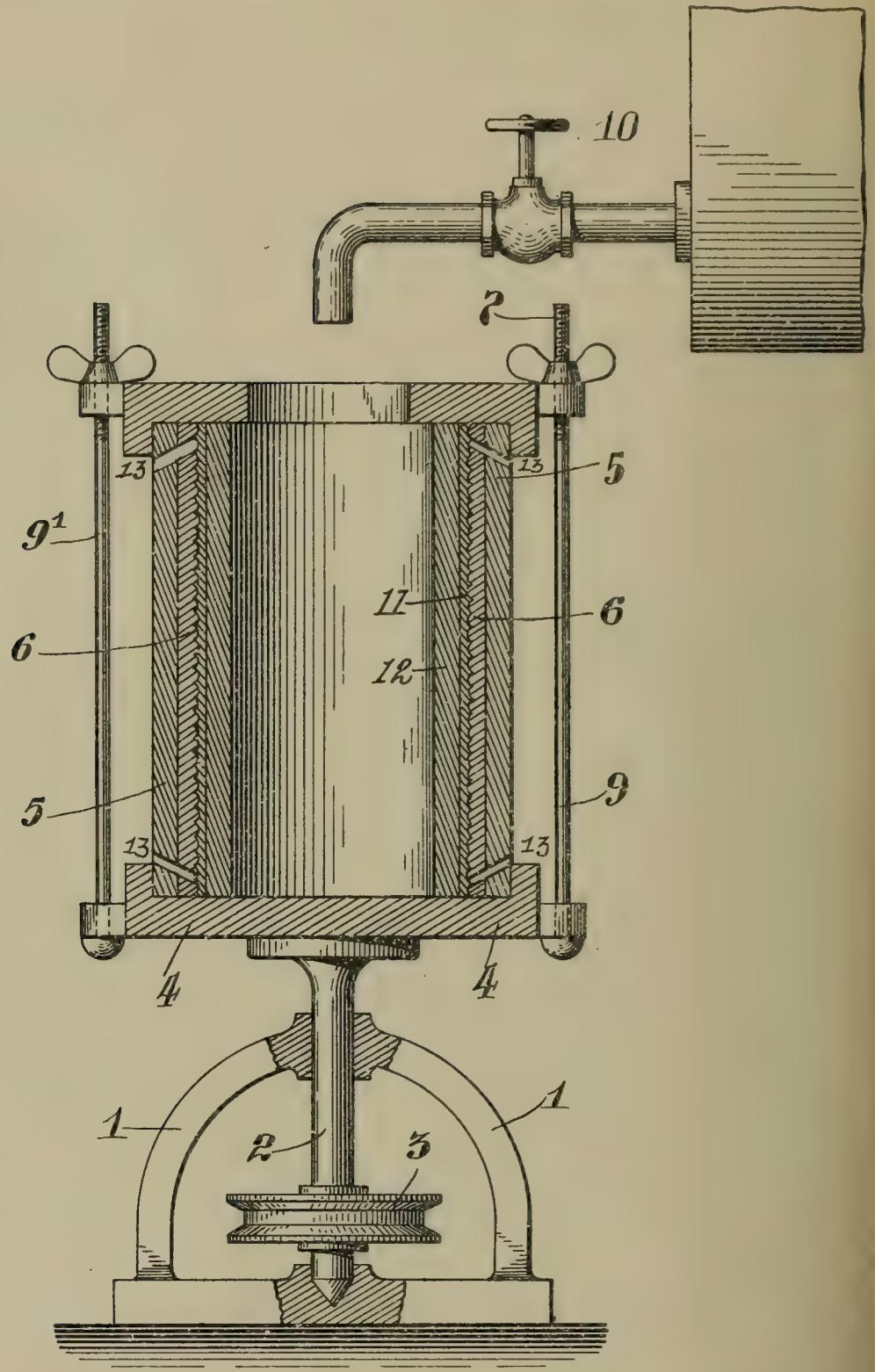
Witnesses:

HARRY L. DUNCAN,
JOHN N. MOORE.

F. W. MATTHEWS.
 PROCESS OF DUPLICATING PHONOGRAMS.
 APPLICATION FILED AUG. 16, 1909.

951,483.

Patented Mar. 8, 1910.



Attest:
W. O. Mitchell
C. S. Ashley

Frederick W. Matthews,
 Inventor:
 by *Robt. B. Hill* *gc.*
 Atty

UNITED STATES PATENT OFFICE.

FREDERICK W. MATTHEWS, OF NEW YORK, N. Y.

PROCESS OF DUPLICATING PHONOGRAMS.

951,483.

Specification of Letters Patent.

Patented Mar. 8, 1910.

Application filed August 16, 1909. Serial No. 513,193.

To all whom it may concern:

Be it known that I, FREDERICK W. MATTHEWS, a citizen of the United States, residing at the borough of Brooklyn, city of New York, in the county of Kings and State of New York, have invented certain new and useful Improvements in Processes of Duplicating Phonograms, of which the following is a specification.

10 My invention relates to improvements in processes of duplicating phonograms of the so-called "indestructible" type and my objects are the simplification of the processes of manufacture, the cheapening of the cost
15 of production, the use of very thin impressible material for the facing if desired, and the production of faced, backed and imprinted phonograms at one operation if desired.

20 The accompanying drawing is a sectional view of an apparatus by the aid of which the process may be practiced.

The process is a modification of the "spinning" process of duplicating phonograms and the apparatus comprises a frame 1 carrying a shaft 2 provided with a driving pulley 3. The upper end of the shaft carries a base 4 on which a shell 5 rests and within which shell may be placed any desired matrix 6 having a negative phonogram on its inner face. A cap 7 with a central aperture 8 covers the top of the shell and matrix while clamp rods 9, 9' hold all the parts to the base. A faucet 10 affords means for injecting centrifugal pressure material to the apparatus.

In practicing the process a film 11 of any impressible material, either in seamless tubular form, seamed tubular form, or sheet
40 form with overlapped edges is inserted in the matrix (it may be temporarily secured in fixed relation thereto) and the apparatus is put together as shown. The entire apparatus is then revolved at a high rate of speed
45 and any material 12 capable of exerting centrifugal pressure on the impressible film is run into the apparatus and the spinning continued long enough to imprint the negative matrix into the impressible material previously inserted therein thereby producing
50 a positive phonogram. The trapped air between the matrix and the film escapes through the vents 13 during the spinning operation thereby avoiding bald or bare spots

in the record. The centrifugal pressure material may be run into the apparatus either before or during the spinning but in order to form the phonogram the material, film and matrix must be revolved together. By film of impressible material is meant any substance such as celluloid, xylonite, rubber, gelatin or any like material in solid form, as distinguished from a liquid, capable of receiving and retaining the imprint of the matrix either in a cold state, or in a heated state with subsequent cooling, or chemically softened with subsequent hardening.

The material for effecting the centrifugal pressure may be one which does not solidify at ordinary temperatures such as water or mercury and which, after the phonogram has been imprinted, may be removed from the apparatus before the backing is applied. Or it may be a plastic substance or a semi-solid substance which effects the pressure and then solidifies to form the backing to support the record film. The internal centrifugal pressure material may be a plug or mandrel inserted within the film of impressible material which plug or mandrel is capable of exerting centrifugal pressure by expansion when spun. The heat when necessary may be applied either externally or the centrifugal pressure material may be heated so that the heat is applied to the film internally. After the phonogram has been spun and imprinted the cap 7 is removed, the phonogram withdrawn from the matrix and if the backing has been inserted during the spinning operation it is reamed to size and finished. If no backing has been inserted any suitable backing may be put in thus completing the record.

By this process a much thinner film of impressible material may be used than is possible with heretofore existing processes thus cheapening the cost of production. If the backing is formed inside the phonogram during the spinning the cost is still further reduced.

I am aware that plastic material has been placed in a revolving matrix and phonograms imprinted directly on such plastic material by centrifugal action and do not claim any such processes, my invention being confined to imprinting phonograms on films of impressible material by centrifugal action

exerted thereon by some material inserted within the film, which material is capable of exerting centrifugal force when spun.

I claim:—

5 1. The process of duplicating phonograms comprising the introduction of a film of im-
pressible material within a matrix, intro-
10 ducing material capable of exerting cen-
trifugal pressure within the film, revolving
the matrix, film and material at a speed suffi-
cient to imprint the matrix in the film by
centrifugal action and removing the phono-
gram thus formed.

15 2. The process of duplicating phonograms comprising the introduction of a film of im-
pressible material within a matrix, intro-
ducing material capable of exerting cen-
trifugal force within the film, softening the
film, revolving the matrix film and material
20 at a speed sufficient to impress the matrix in
the softened film by centrifugal action, har-
dening the film to retain the imprint and
removing the phonogram thus formed.

25 3. The process of duplicating phonograms comprising the introduction of a film of im-
pressible material within a matrix, intro-
ducing material capable of exerting cen-
trifugal pressure within the film, said mate-
30 rial also being capable of solidifying to form
a backing for the phonogram, revolving said
matrix, film and material at a speed suffi-
cient to imprint the matrix in the film by
centrifugal action and enough longer to per-
35 mit the solidifying of the backing in inti-
mate contact with the imprinted film and re-
moving the record thus formed.

40 4. The process of duplicating phonograms comprising the insertion of a film of im-
pressible material within a matrix, revolv-
ing film and matrix, introducing material
capable of exerting centrifugal pressure
within the revolving matrix and film where-

by the matrix is imprinted in the film by
centrifugal action and removing the phono-
gram.

45 5. The process of duplicating phonograms comprising the insertion of a film of impres-
sible material within a matrix, revolving film
and matrix, softening the film, inserting
material capable of exerting centrifugal
50 pressure within the film whereby the matrix
is impressed in the film by centrifugal ac-
tion, hardening the film to retain the im-
print and removing the phonogram.

55 6. The process of duplicating phonograms comprising the introduction of a film of im-
pressible material within a matrix, intro-
ducing material capable of exerting cen-
trifugal pressure within the film, revolving
the matrix, film and material at a speed
60 sufficient to imprint the matrix in the film
by centrifugal action, removing the pres-
sure material, inserting material to form a
backing which backing is secured to the film
by centrifugal action on the continued revo-
65 lution of matrix, film and backing and re-
moving the phonogram.

70 7. The process of duplicating phonograms comprising the introduction of a film of im-
pressible material within a matrix, intro-
ducing material capable of exerting cen-
trifugal pressure within the film, revolving
the matrix, film and material at a speed
75 sufficient to imprint the matrix in the film
by centrifugal action, permitting the trapped
air between the matrix and film to escape
and removing the finished phonogram.

In testimony whereof I have affixed my
signature in presence of two witnesses.

FREDERICK W. MATTHEWS.

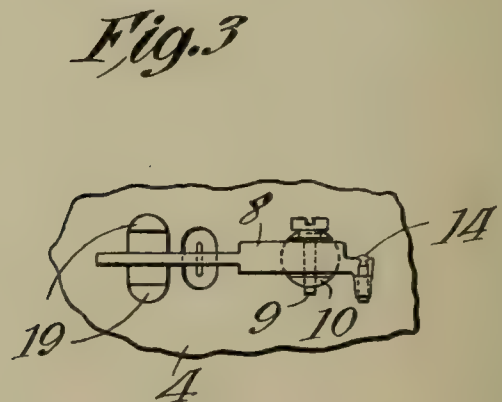
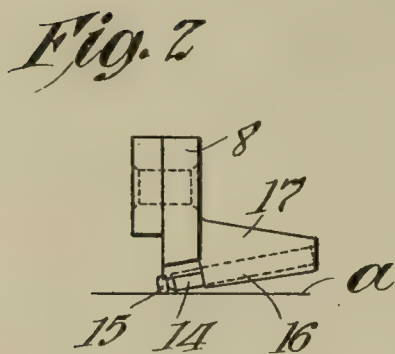
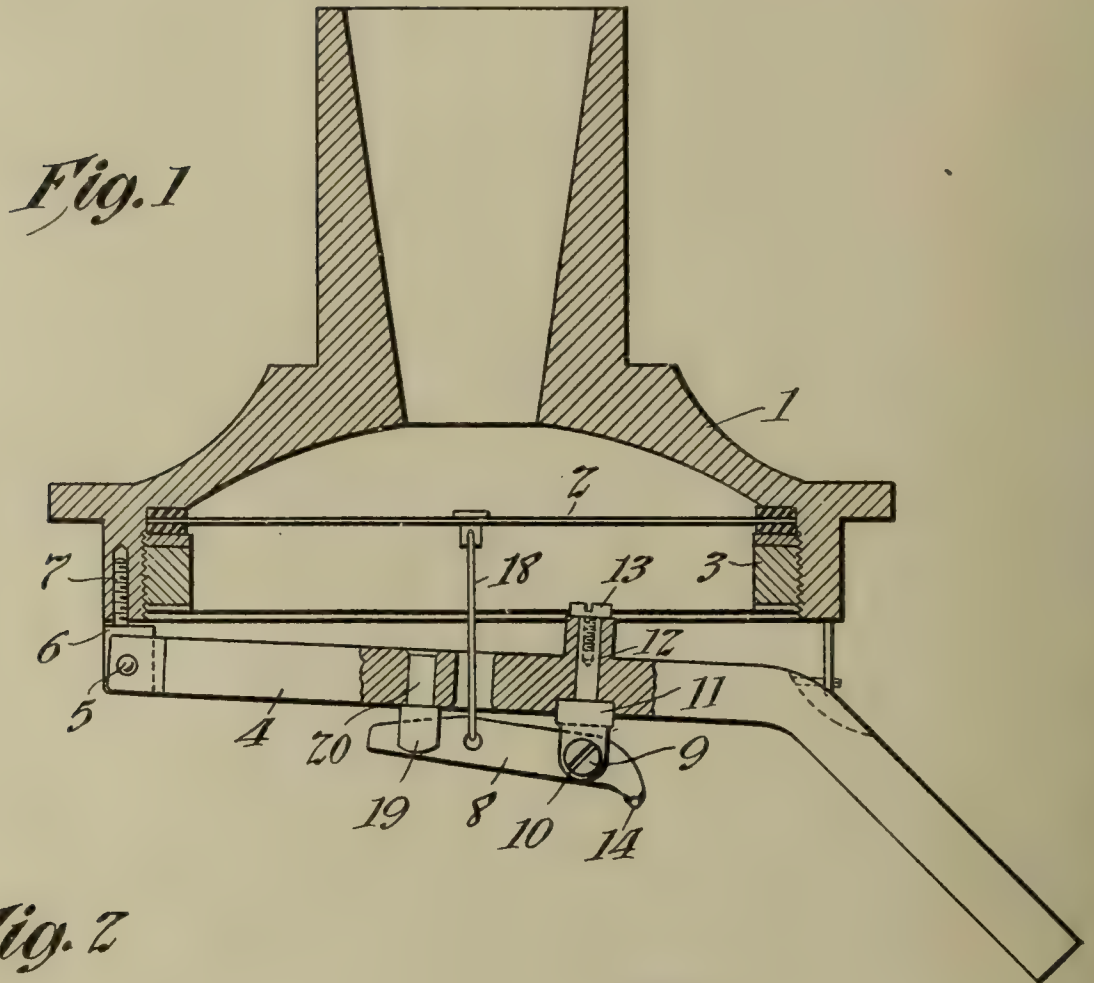
Witnesses:

ROBT. B. KILLGORE,
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P. WEBER.
 PHONOGRAPH REPRODUCER.
 APPLICATION FILED OCT. 8, 1908.

951,496.

Patented Mar. 8, 1910.



Witnesses:
 Frank D. Lewis
 Delos Holden

Inventor:
 Peter Weber
 by Frank L. Green
 Attys.

UNITED STATES PATENT OFFICE.

PETER WEBER, OF ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH-REPRODUCER.

951,496.

Specification of Letters Patent.

Patented Mar. 8, 1910.

Application filed October 8, 1908. Serial No. 456,701.

To all whom it may concern:

Be it known that I, PETER WEBER, a citizen of the United States, and a resident of Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Reproducers, of which the following is a description.

My invention relates to phonograph reproducers, and has for its object the provision of an improved stylus and mounting therefor, adapted more particularly for use with records in which the pitch of the record groove is one two-hundredth ($1/200$) of an inch. In order to properly track records of this character as now on the market it is necessary that the reproducer stylus be of microscopic size, since the record groove is formed by a stylus having a curved cutting edge, the diameter of which is only .008 of an inch. The reproducer stylus should have a rounded surface and should be so shaped as not to cause undue wear upon the record. It should also be supported in such a manner as to be capable of lateral movement, so that it will track the record groove properly; and it is also desirable that the stylus should be so connected to the diaphragm that the vertical movement of the stylus will be magnified, so as to produce an amplified movement of that portion of the diaphragm to which it is connected. These advantages are secured by the structure herein described and claimed.

In order that my invention may be more clearly understood, reference is hereby made to the accompanying drawing, of which—

Figure 1 is a side elevation, partly in section, of a phonograph reproducer constructed in accordance with my invention; Fig. 2 is an end view, showing the stylus lever and stylus carried thereby in operative position with respect to the record surface, and Fig. 3 is a bottom plan view of the same and of the adjacent portion of the floating weight.

The reproducer shown comprises a sound box body 1 of usual form, within which the diaphragm 2 is clamped by the ring 3. The floating weight 4 is pivoted in the usual manner at 5 to the pivot block 6, supported by the screw 7, which is threaded within the body 1. The stylus lever 8 is pivoted on the screw 9, which is threaded within the lugs 10, depending from the member 11. The

latter has an integral pin 12, rotatably mounted in the floating weight and supported by the screw 13 threaded within the end of said pin. This pin turns freely about its axis, and thereby permits lateral movement of the stylus 14 with respect to the record surface. This stylus, as shown, is formed with a button-shaped head 15 and a cylindrical shank 16, which is secured to a socket formed in the ear 17, which is integral with the lever 8. The shank 16 occupies an inclined position with respect to the record surface *a* (see Fig. 2). The radius of curvature of the head 15 of the stylus 14 in a plane transverse to the record groove is much smaller than the radius of curvature of the head in a plane parallel with the record groove. The bearing surface of the head is therefore narrow in a lateral direction whereby it is able to track the bottom of the record groove at all times, and it is comparatively broad in the direction along the record groove, whereby the tendency of the stylus to cut into or unduly wear the record surface is greatly reduced. A stylus of this shape having a bearing surface in which the diameters along and across the record groove are respectively .016 and .008 inch will track in a perfect manner a record of the type previously referred to without undue wear and is of such size that it can be readily handled and inspected by workmen in its various stages of manufacture, and can be produced by ordinary manufacturing processes and by workmen of ordinary skill.

There is a link 18 applied in the usual manner to the center of the diaphragm 2, and the lower end of the same is connected to the stylus lever 8 at a distance from its fulcrum which is considerably greater than the distance of the stylus 14 from the said fulcrum, whereby the movements of the stylus are exaggerated or amplified in their transmission to the center of the diaphragm. The angular movement of the lever 8 about the axis of the pin 12 is limited by a pair of stops 19 which depend from the pin 20, rigid with the floating weight 4.

Having now described my invention, what I claim is:

1. In a phonograph reproducer, a stylus formed with a surface curved upon different radii and adapted to engage a record groove of a maximum width considerably less than .01 inch, and means for supporting the same

in such a position that the radius of curvature in a plane parallel to the direction of said groove, is greater than the radius of curvature in a plane at right angles thereto, substantially as set forth.

2. In a phonograph reproducer, a stylus having a rounded engaging surface adapted to track the record groove and a shank, and means for supporting the same in such a position that the shank extends transversely to the tangent to every record groove at the point contacted by the engaging surface of the stylus at any instant, substantially as set forth.

3. In a phonograph reproducer, a stylus having a rounded engaging surface adapted to track the record groove and a shank, and means for supporting the same in such a position that the shank extends substantially at right angles to the tangent to the record groove at the point contacted by the engaging surface of the stylus at any instant, substantially as set forth.

4. In a phonograph reproducer, a stylus having a rounded engaging head adapted to engage the record groove and a shank, and means for supporting the same in such a position that the shank extends transversely to the tangent to the record groove at every point contacted by the engaging surface of the stylus at any instant and is inclined upwardly with respect to the record surface at said point, substantially as set forth.

5. A reproducer stylus having a bearing surface curved in a plane transverse to the record groove on a radius sufficiently small to enable it to engage a record groove of circular cross-section and of a maximum width of not greater than .005 inch and curved on a substantially greater radius in a plane at right angles to said first plane, substantially as set forth.

6. In a phonograph reproducer, a stylus formed with a surface curved upon different radii and adapted to engage the record groove, and means for supporting the same in such a position that the radius of curvature in a plane parallel to the direction of said groove is greater than the radius of

curvature in a plane at right angles thereto, a diaphragm, and an amplifying connection between said stylus and diaphragm, substantially as set forth.

7. In a phonograph reproducer, the combination of a stylus comprising a shank having at one end a rounded disk-shaped head at right angles thereto, the periphery of the disk being curved in a direction transverse to its diameter on a curve the radius of which is less than the radius of the disk, and a stylus lever having a boss at right angles to the length thereof provided with a socket for receiving the said shank, substantially as set forth.

8. As an article of manufacture, a stylus lever provided with a socket extending transversely to the plane of the lever and adapted to receive a stylus.

9. As an article of manufacture, a stylus lever having an extension transverse to the plane of said lever and provided with a socket adapted to receive a stylus.

10. As an article of manufacture, a stylus lever having an extension approximately at right angles to the plane thereof provided with a longitudinal socket adapted to receive a stylus.

11. In combination, a diaphragm, a stylus lever provided with means to support a stylus approximately at right angles to the plane thereof, means to support said lever, and means to connect said lever to said diaphragm in such a manner that the movements of the free end of the lever are exaggerated in their transmission to said diaphragm.

12. As an article of manufacture, a stylus lever and a stylus extending therefrom transversely to the plane thereof and having its bearing surface substantially in said plane, substantially as set forth.

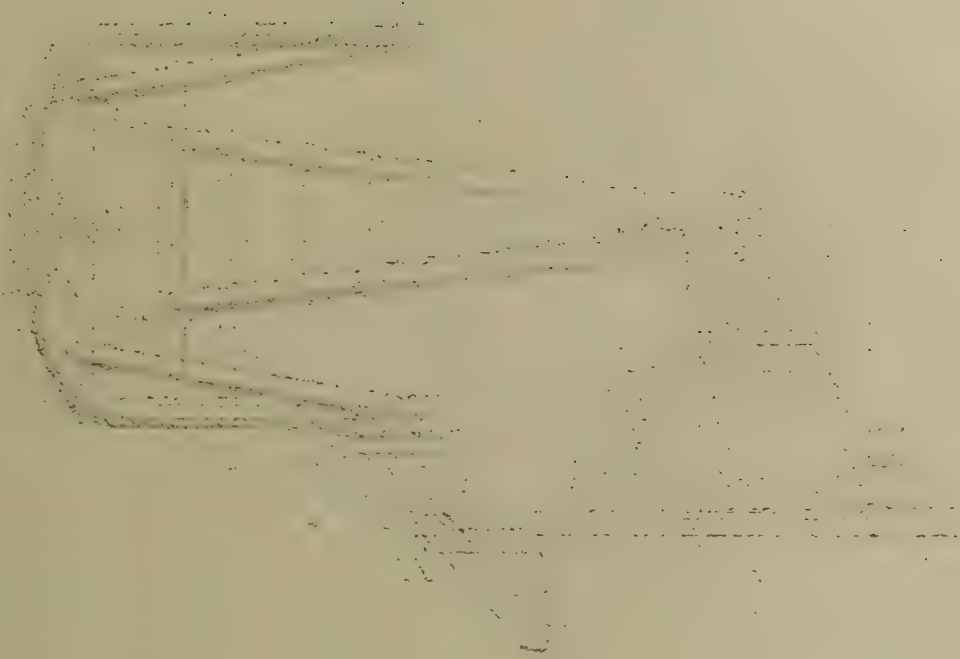
This specification signed and witnessed this 30th day of Sept. 1908.

PETER WEBER.

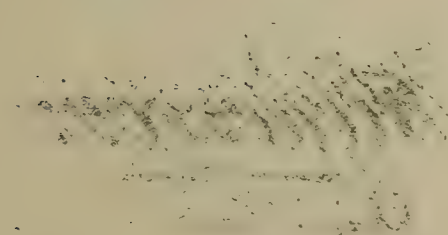
Witnesses:

JOHN M. CANFIELD.

FRANK D. LEWIS.



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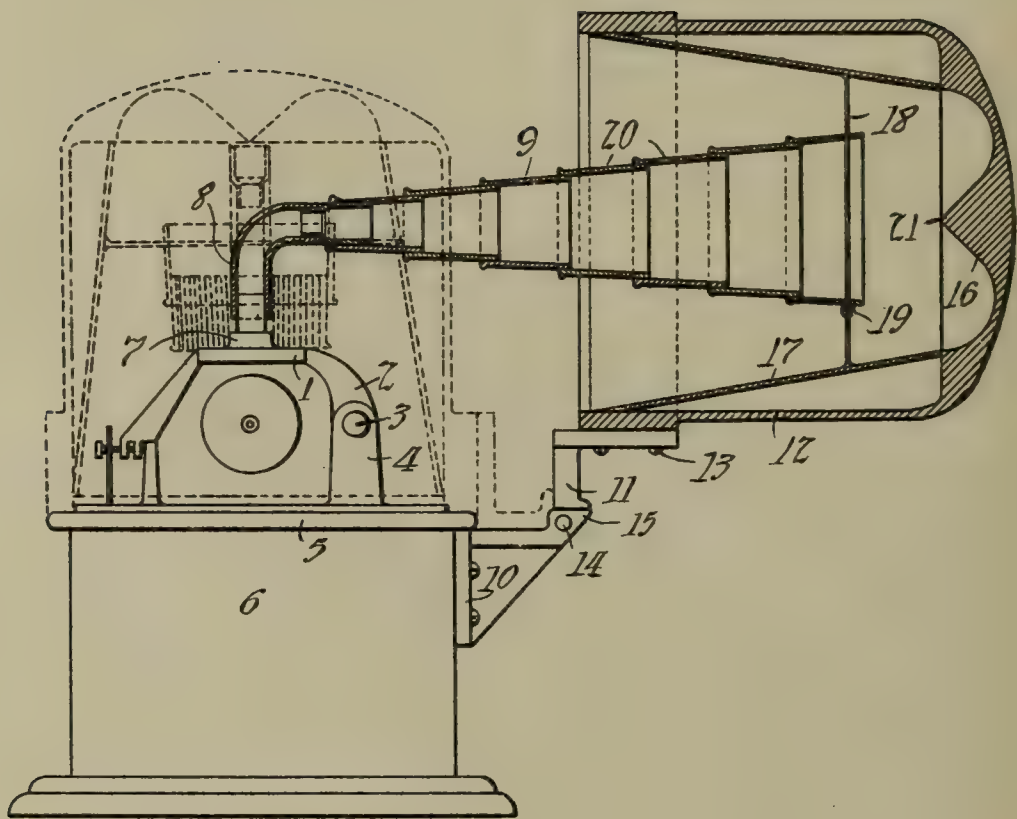


F. L. DYER.
PHONOGRAPH.

APPLICATION FILED JULY 22, 1909.

951,757.

Patented Mar. 8, 1910.



Witnesses:
Frank D. Lewis
Dyer Smith

Inventor:
Frank L. Dyer

UNITED STATES PATENT OFFICE.

FRANK L. DYER, OF MONTCLAIR, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH.

951,757.

Specification of Letters Patent.

Patented Mar. 8, 1910.

Application filed July 22, 1909. Serial No. 509,037.

To all whom it may concern:

Be it known that I, FRANK L. DYER, a citizen of the United States, and a resident of Montclair, in the county of Essex and State of New Jersey, have made a certain new and useful Invention in Phonographs, of which the following is a description.

My invention relates to phonographs, and the object thereof is, broadly speaking, the production of a compact and efficient device for the conveying and dissemination of sound in the reproduction thereof. More specifically, my device is an improvement on the invention of Peter Weber disclosed in his application for improvements in phonographs, Serial No. 509,061, filed on even date herewith. In the invention of the said Weber, a structure is provided wherein the cover for the phonograph is pivoted and when in open position may be supported in such position that a sound conveying tube connected with the neck of the reproducer may deliver the sound waves set up by the vibration of the reproducer diaphragm into the interior of the said cover. The cover is provided in its interior with sound deflecting means and means for conveying the sound so deflected smoothly to the open or bottom end of the cover, this sound conveying means within the body of the cover being of such a character as to amplify the sound. In my improvement on this structure, the sound conveying tube consists of telescoping sections supported within the cover, whereby, when the cover is in open position, the tube may be extended into the same to deliver the sound waves from the reproducer against the deflecting means within the cover, while, when the cover is in closed position incasing the phonograph, the sound conveying tube or horn is collapsed within the same. By this construction, sound conveying and amplifying means of sufficient amplification are provided in a compact space when the cover is open, the whole device being self-contained and compact when the cover is closed.

For a more perfect understanding of my invention, attention is hereby directed to the accompanying drawing, forming part of this specification, representing an end elevation of a phonograph equipped with my device, the sound conveying tube and the cover being shown in section for the open position of the cover, these parts being

shown in dotted lines in the positions occupied thereby when the cover is closed.

Referring to the drawing, the sound box 1 of the reproducer is carried by the traveling arm 2 which slides upon guide rod 3 mounted in bracket 4 which is supported upon bed plate 5 carried by the supporting cabinet 6, as is common. The neck 7 of the reproducer is connected by a rubber or other elastic connection 8 to the sound conveying tube 9, the end of connection 8 fitting over a reduced diameter of the small end of the sound conveying tube 9 to form a flexible or telescoping connection thereby. The bracket 10 is suitably secured preferably to the rear side of casing 6. Upon this bracket 10 the bracket 11 to which the cover 12 of the phonograph is rigidly secured as by screws 13, is pivoted, as shown at 14. The cover 12 is adapted to swing through a right angle about a pivot 14, the cover being shown in its closed position in dotted lines, and in its open position by the full line structure. It is, of course, obvious that the open position of the cover need not be exactly 90 degrees away from the closed position. The outer end of bracket 10 carrying pivot rod 14 is provided with a nose upon which a corresponding lug on bracket 11 rests when the cover is in open position, supporting means for the cover thus being provided when the cover is moved through approximately 90 degrees from its closed position, or to whatever position the cover occupies when open. It is, of course, obvious that if desired, additional supporting means for the cover when in open position may be provided. The inside of the top of the cover is provided with a sound deflecting surface 16 against which the sound waves conveyed by tube 9 are adapted to be directed and smoothly deflected therefrom to the sound conveying and amplifying surface 17 within the cover by which the sound waves are directed to the open end of the cover. The surface 17 may be tapered as shown, or given any other desired conformation. The tube 9 is preferably supported when the cover is in open position with the large or exit end thereof inserted within the open cover and in position to direct the sound waves against the surface 16. The tube 9 may be supported in such position by any convenient means, as for example, by means of the rod 18 ex-

tending diametrically across the inside of the cover from the upper to the lower portion of the surface 17 and passing through the upper and lower surfaces of the tube 9.

5 The rod 18 is provided with a suitable supporting means for the tube 9, as the enlargement 19, which, as shown in the drawing, is provided on rod 18 immediately below the lower surface of the tube 9. By this means, 10 the tube 9 rests upon the ball or enlargement 19 and may swing pivotally about rod 18. Tube 9 is provided with a plurality of telescoping sections 20, the larger end of each of which fits snugly within the smaller 15 end of the adjoining section. When the cover is in open position, these sections are drawn out to the greatest extent possible to form a continuous tube, the diameters of the respective ends of the various sections 20 being so chosen as to prevent the complete withdrawal of one section from the next. When it is desired to close the cover, the elastic connection 8 is simply removed from its connection with the neck of the repro- 25 ducer, when the cover may be closed, the various sections 20 of the tube 9 then collapsing into the position shown in dotted lines in the figure. Deflecting surface 16 on the inner side of the cover may be of any 30 desired conformation for smoothly guiding the sound waves to the mouth of the cover without loss of the same. As shown in the drawing, this surface preferably consists of two smooth and similar curves extending 35 from apex 21 opposite the axis of tube 9 and delivering sound waves therefrom to the surface 17.

Having now described my invention, what I claim and desire to protect by Letters Patent of the United States is as follows:

1. In a sound reproducing machine, the combination with a reproducer and a support therefor, of a cover for the reproducer, means pivotally supporting said cover from 45 the side of said support, whereby said cover may be supported in open position with the vertical axis of the cover in a substantially horizontal plane, said cover being provided with a sound amplifier on the interior there- 50 of, and means for conveying and directing

sound from said reproducer to said amplifier comprising a telescoping sound conveying tube connected to the neck of said reproducer and adapted to be extended into said cover when the latter is in open position, or col- 55 lapsed within the same when the latter is in closed position, substantially as described.

2. In a sound reproducing machine, the combination with a reproducer and a support therefor, of a cover for the reproducer, 60 means pivotally supporting said cover and means whereby said cover may be supported in open position, said cover being provided on the interior thereof with means for de- 65 flecting and guiding sound waves impinging on the inner side of said cover to the open end thereof, and means for conveying and directing sounds from said reproducer into the interior of said cover and against said 70 deflecting means, said conveying means comprising a telescoping tube adapted to be extended into said cover when the latter is in open position and collapsed within the same when the latter is in closed position, substan- 75 tially as described.

3. In a sound reproducing machine, the combination with a reproducer and a support therefor, of a cover for the reproducer, means pivotally supporting said cover and means whereby said cover may be supported 80 in open position, said cover being provided on the interior thereof with means for de- flecting and guiding sound waves impinging on the inner side of said cover to the open end thereof, means for conveying and direct- 85 ing sounds from said reproducer into the interior of said cover and against said de- flecting means, said conveying means comprising a telescoping tube adapted to be ex- 90 tended into said cover when the latter is in open position and collapsed within the same when the latter is in closed position, and means within said cover for supporting said tube, substantially as described.

This specification signed and witnessed 95 this 9th day of July 1909.

FRANK L. DYER.

Witnesses:

DYER SMITH,
ANNA R. KLEHM.

R. HEAD.
 PHONOGRAPH REPRODUCER.
 APPLICATION FILED MAY 18, 1904.

951,781.

Patented Mar. 8, 1910.

Fig. 1.

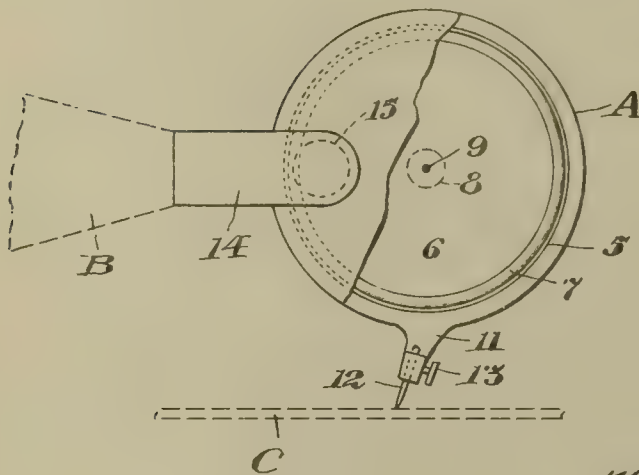


Fig. 2.

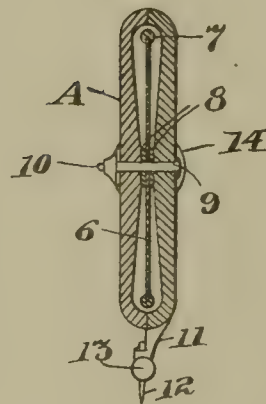


Fig. 3.

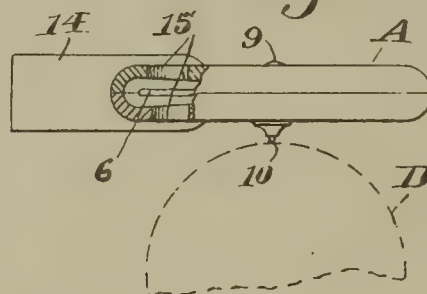


Fig. 6.

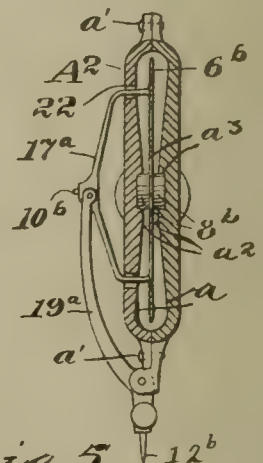


Fig. 4.

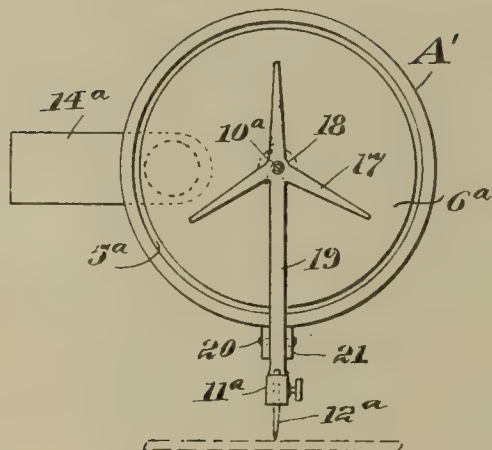
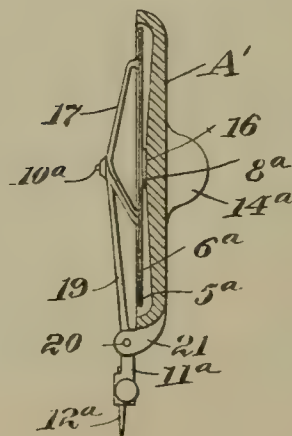


Fig. 5.



WITNESSES:

Edwin Walker
 V. E. Nichols

INVENTOR

Robert Head,

BY

Griffin Bernhard & Cavanagh
 ATTORNEY

UNITED STATES PATENT OFFICE.

ROBERT HEAD, OF NEW YORK, N. Y.

PHONOGRAPH-REPRODUCER.

951,781.

Specification of Letters Patent.

Patented Mar. 8, 1910.

Application filed May 18, 1904. Serial No. 208,540.

To all whom it may concern:

Be it known that I, ROBERT HEAD, a citizen of the United States, residing at the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Phonograph-Reproducers; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in phonograph reproducers, wherein I seek to provide an improved construction adapted for the reproduction of sounds which are free from harsh metallic tones and grating noises, the latter being serious objections to ordinary talking machines.

Another part of the invention is the provision of a sound box, which is constructed and arranged for use in connection with a disk record or a cylindrical record, such end being attained without change in the structure of the sound box and by simply changing the position thereof.

Another part of my invention is an improved reproducer embracing a vibratory diaphragm which is mounted in a novel manner to secure greater sensitiveness and an increased amplitude of vibration, and furthermore, to so construct the diaphragm as to prevent it from splitting, and to make it work steadily under the vibration given thereto.

The invention resides, broadly, in a reproducer having a vibratory diaphragm held or confined in or on a suitable body, the edges being free or unconfined, as distinguished from an ordinary reproducer wherein the edge portion of the diaphragm is fixed or secured firmly to the body.

The invention further consists of a phonograph reproducer wherein I use a sound box chambered for the reception of a non-metallic diaphragm.

The invention further consists in the employment of a non-metallic diaphragm having a rim which imparts weight to the free edge of the diaphragm, said rim also serving in connection with a mica diaphragm as a means for preventing the layers from separating or splitting.

The invention further consists of a phonograph reproducer comprising a sound box having a plurality of styli arranged and adapted for use on different classes of records of either cylindrical or disk form,

either stylus being brought into its working position by a simple change in the position of the sound box.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which like characters of reference are used to indicate corresponding parts in the several figures.

Figure 1 is a side elevation, partly broken away, and showing my reproducer adapted for use in connection with a disk record. Fig. 2 is a cross section of the sound box of Fig. 1. Fig. 3 is a sectional elevation of the sound box adjusted for use on a cylindrical record. Figs. 4 and 5 are views in side elevation and cross section respectively of another form of sound box. Fig. 6 is a cross section of still another form of sound box.

In the embodiment of the invention shown by Figs. 1 to 3 inclusive, A designates a sound box which is, practically, closed and provides a sound chamber 5. Within this sound box is arranged a vibratory diaphragm 6, the same being made preferably of non-metallic material and mounted or held centrally in the sound chamber 5. According to one embodiment of the invention, the diaphragm 6 is made of mica, or other suitable material. Such a diaphragm is equipped with a rim 7 that imparts weight to the free edge portion of the diaphragm, said rim being adapted to embrace the edge of the mica and prevent the layers from splitting and separating under the vibrations which are given to the diaphragm. This rim may be of sheet metal, crimped or folded around the edge of the diaphragm.

The sound box has inclined walls which converge toward the center so as to confine or hold the diaphragm centrally, and as shown by Fig. 2, washers 8 are interposed between the diaphragm and the walls of the sound box, thus separating the diaphragm from direct contact with said sound box. A pin or stem 9 passes through the sound box, the washers and the diaphragm to assist in holding the latter firmly in place without fastening its edge or rim in the reproducer. With this stem is associated a stylus 10 which is outside of the sound box and projects in one direction from the same, said stylus extending laterally or from one side of the sound box. This stylus is preferably of a non-metallic nature, such as glass, and it is united directly in a suitable way, as by

cementing, to the pin 9, thus associating said stylus 10 with the diaphragm for imparting vibrations thereto. The sound box is furthermore provided with another stylus holder 11,

5 which is shown as projecting from the edge of said box and in a different direction from the stylus 10. This holder 11 is adapted for the reception of a stylus 12, in the shape of a pin which is held or confined in said holder
10 by any suitable means, such as the clamp 13 that is represented as a binding screw.

A hollow neck 14 projects beyond one edge of the sound box, as shown. This neck is attached to, or forms a part of the sound
15 box, and it is in communication with the chamber 5, thereof by an opening 15, the latter being provided in one or both walls of the sound box, as indicated by full and dotted lines. This neck coöperates with a suitable form of horn B, which may be united
20 to the neck or the latter may be part of the horn.

The two styluses, 10, 12, enable the reproducer to be used in connection either with a
25 disk record, as C in Fig. 1, or with a cylindrical record, as D in Fig. 3. By adjusting the sound box, A, in the vertical position shown in Figs. 1 and 2, the stylus 12 is imposed on the disk record C to follow the undulations therein, and to be influenced there-
30 by so as to transmit the vibrations to the diaphragm 6, thereby vibrating the latter in the chamber 5, and producing sound waves which flow through the neck 14 into and through the horn B. For using the repro-
35 ducer on the cylindrical record D, the sound box is turned to a horizontal position, as in Fig. 3, thus bringing the glass stylus 10 into position to ride on the record, whereby the
40 vibrations are communicated to the diaphragm for reproducing the sounds.

Another form of construction is shown by Figs. 4 and 5, wherein an open sound box A' is employed in connection with a centrally
45 held non-metallic diaphragm 6^a. This reproducer has a body open on one side and formed with a chamber 5^a, the wall of which has a bearing face 16 for the reception of a washer 8^a that separates the diaphragm
50 from direct contact with the sound box.

To make the diaphragm more sensitive I provide a spider 17 having a plurality of arms that engage at a number of points with
55 said diaphragm, said arms resting on or being attached to the diaphragm. Said spider is shown as lying opposite to the open side of the sound box, and it is attached centrally to the diaphragm by a pin or stem 18, the latter being equipped with one stylus 10^a.
60 Said spider has an arm 19, the same being pivoted by a pin 20 on a lug 21 of the sound box, and with this arm is associated another stylus 12^a that is suitably fastened to the stylus holder 11^a.

The construction of Figs. 4 and 5 includes 65 the same elements as the device of Figs. 1, 2 and 3, the same being adapted for use in substantially the same way.

As another construction of the reproducing sound box adapted for centrally clamp- 70 ing a non-metallic diaphragm, I have shown the box A² of Fig. 6 made of complementary sections *aa*, each of dished form, and flanged circumferentially in a way to be united by the screw *a'*. These box sections are thick- 75 ened centrally at *a*², and provided with sockets *a*³, the latter receiving the washers 8^b, of fiber or other suitable material. These washers are arranged to be clamped forcibly upon the metal portion of the diaphragm 6^b,
80 by the sections *a* when they are drawn together by the screws *a'*. A stem or pin may or may not be used to fasten the diaphragm securely to the sound box and the washers, said diaphragm being thus held centrally in
85 the chamber of the box and free to vibrate throughout the major portion of its area.

Another form of construction is represented by Fig. 6, wherein an externally lo- 90 cated spider is combined with a closed sound box and a diaphragm mounted in said box.

The diaphragm 6^c is held centrally in the sound box A³ in either of the ways heretofore described, and in one side or sections of this sound box there are provided openings 95 22 which permit the legs of the spider 17^a to play freely in the box, said legs being attached to or associated with the diaphragm for the purpose of imparting vibrations thereto. This spider carries a cylinder re- 100 cord stylus 10^b, and to the spider is pivoted an arm 19^a that also has pivotal connection with the sound box, said arm being combined with a stylus 12^b adapted to ride on a disk record.

The employment of the spider tends to 105 increase the sensitiveness of the diaphragm, and it makes provision for the use of the styluses 10^b and 12^b, which are adapted for coöperation with the different kinds of records by merely shifting or changing the
110 position of the sound box.

The stylus adapted for coöperation with a curvilinear record, such as the stylus 10 of Figs. 2 and 3, the stylus 10^a of Figs. 4 and 5, and the stylus 10^b of Fig. 6, is composed of 115 rigid material, preferably of a non-metallic nature, such as glass. On the other hand, the stylus which is adapted for coöperation with a plane record, such as the stylus 12 of Figs. 1 and 2, 12^a of Figs. 4 and 5, and the stylus
120 shown in Fig. 6 as extending from the perimeter of the sound box or body portion, consists preferably of a flexible needle, as shown in the drawings.

Although I have shown a reproducer with 125 a diaphragm held centrally in a sound box, it is evident that the diaphragm may be fastened at its edges to said box. Further-

more, a thin metal diaphragm may be used in lieu of a mica diaphragm.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. A sound reproducer comprising a sound-box, and a diaphragm held against movement at its middle or central portion, the edge portion of the diaphragm being free.

2. A sound reproducer comprising a sound-box, and a diaphragm held or confined against movement at its middle or central portion only.

3. A phonograph reproducer, comprising a sound box, and a mica diaphragm mounted at its central portion therein, said diaphragm being free to vibrate at its edge and throughout the major portion of its area.

4. A sound reproducer having a diaphragm held centrally from movement and provided with a rim at its edge portion.

5. A sound reproducer having a diaphragm held centrally against movement, and a rim embracing the edge portion of said diaphragm.

6. A phonograph reproducer, comprising a sound box and a diaphragm fastened at its center thereto, the edge portion of the diaphragm being unconfined.

7. A phonograph reproducer, comprising a sound box, a diaphragm held centrally against movement therein, and one or more interposed spacing devices at the central part of the diaphragm.

8. A phonograph reproducer, comprising a sound box, a diaphragm unconfined at its edge, and a transverse pin or stem passing through the diaphragm.

9. A reproducer comprising a body portion, a diaphragm substantially incased by said body portion, and a plurality of reproducing styluses cooperating with said diaphragm, one of said styluses extending in one direction from the body portion so as to cooperate with a plane record, and another of said styluses extending in a different direction from the body portion for the purpose of enabling the second named stylus to cooperate with a curvilinear record.

10. In a reproducer, a chambered body portion, a diaphragm cooperating therewith, and a plurality of reproducing devices operatively related to said diaphragm, said reproducing devices extending in different directions from the body portion, whereby in one position of the body portion one of said reproducing devices is adapted for cooperation with a plane record and by a partial rotation of the body portion the other of said reproducing devices is brought

into position for cooperation with a curvilinear record.

11. In a reproducer, a chambered body portion, a diaphragm cooperating therewith, and a plurality of reproducing styluses operatively related to said diaphragm, one of said styluses being composed of substantially unyielding material and adapted for cooperation with a curvilinear record, the other of said styluses being a substantially yielding or flexible needle adapted for cooperation with a plane record.

12. In a reproducer, a chambered body portion, a diaphragm separate from the body portion and attached thereto, and a plurality of reproducing styluses cooperating with said diaphragm, one of said styluses being composed of non-metallic rigid material and adapted for cooperation with a curvilinear record, the other of said styluses consisting of a yielding needle adapted to cooperate with a plane record.

13. A phonograph reproducer, comprising a sound box, a diaphragm, and two styluses, one being arranged to extend laterally from the central part of the diaphragm, and the other projecting from an edge of the sound box.

14. A phonograph reproducer, comprising a sound box, a diaphragm, and a plurality of styluses projecting from the middle and from the edge portions of said box; the sound box being changeable to horizontal or vertical positions and arranged to bring one or the other of the styluses into position for service on a disk or cylinder record.

15. In a reproducer, a sound box, a diaphragm in contact therewith, and a plurality of reproducing styluses, one of said styluses being mechanically connected to the perimeter of the sound box, and another of said styluses being positioned substantially at the central portion of said sound box, laterally thereof.

16. A phonograph reproducer, having a sound box, a diaphragm held against movement at its middle only, and a spider engaging with said diaphragm.

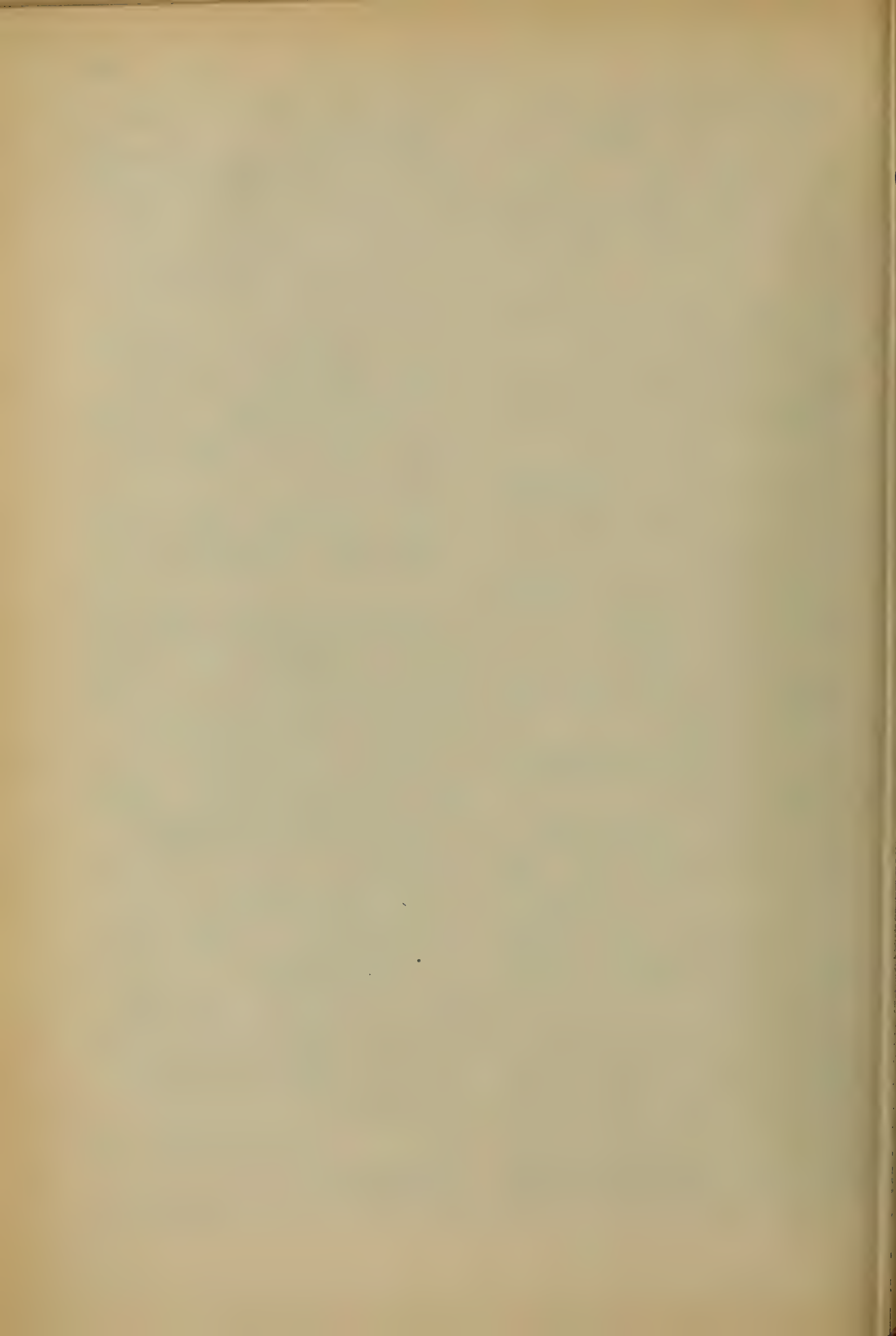
17. A phonograph reproducer having a sound box, a diaphragm inclosed therein, a spider, and a plurality of reproducing styluses associated with said spider, the respective styluses being adapted to cooperate with plane and curvilinear records.

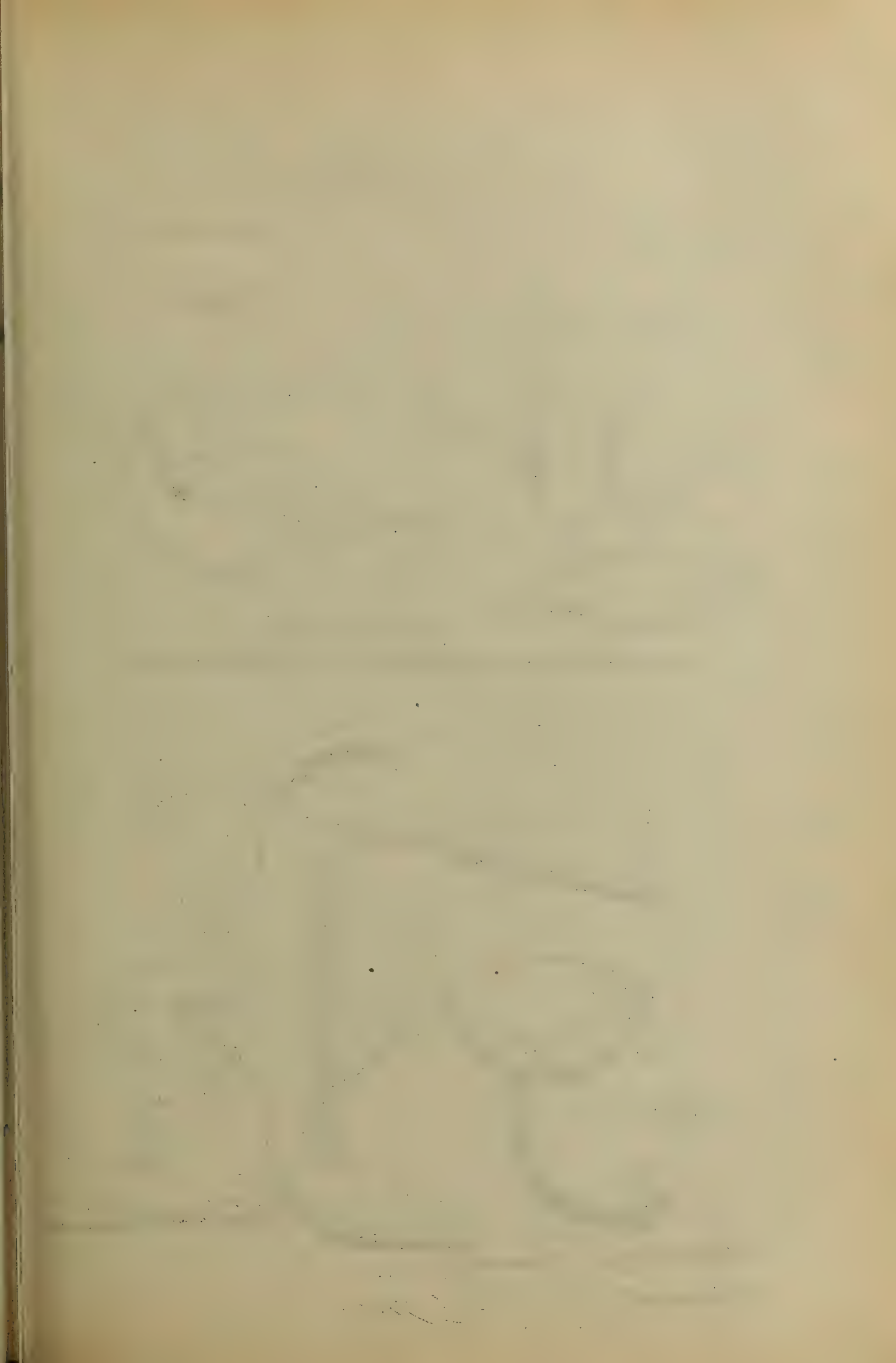
In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ROBERT HEAD.

Witnesses:

JAS. H. GRIFFIN,
EDWIN WALKER.

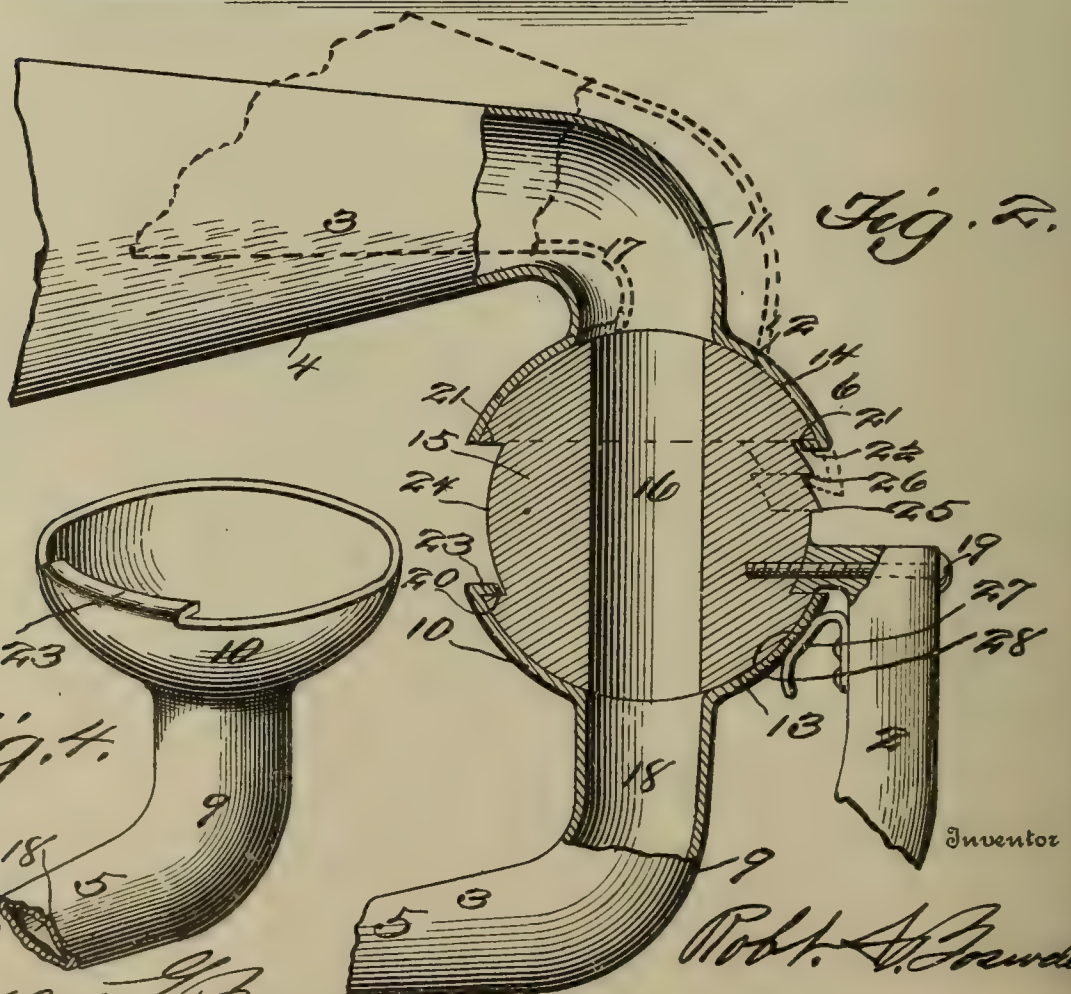
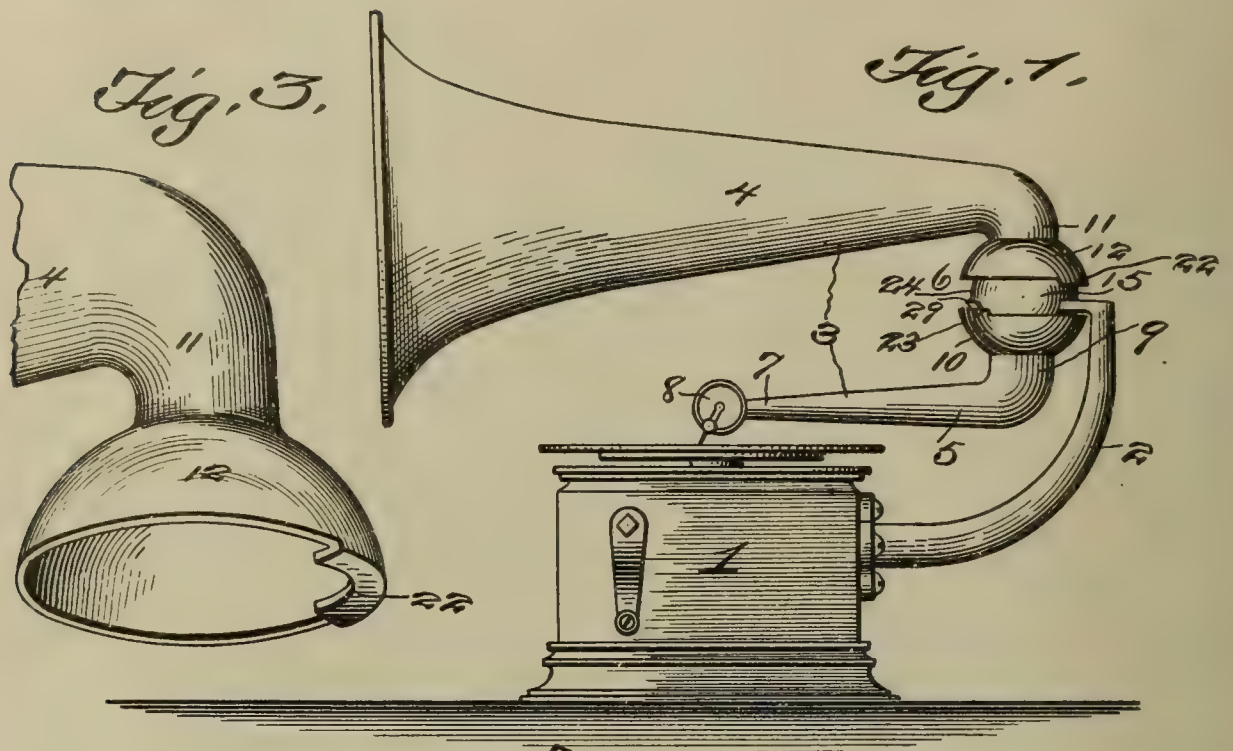




R. A. BOSWELL.
 SOUND CONVEYING TUBE FOR TALKING MACHINES.
 APPLICATION FILED AUG. 3, 1909.

951,998.

Patented Mar. 15, 1910.



Witnesses
 Francis J. Brown,
 Edward S. Ford.

Inventor
 Robt. A. Boswell.

UNITED STATES PATENT OFFICE.

ROBERT A. BOSWELL, OF WASHINGTON, DISTRICT OF COLUMBIA.

SOUND-CONVEYING TUBE FOR TALKING-MACHINES.

951,998.

Specification of Letters Patent.

Patented Mar. 15, 1910.

Application filed August 3, 1909. Serial No. 511,043.

To all whom it may concern:

Be it known that I, ROBERT A. BOSWELL, a citizen of the United States of America, residing at Washington city, District of Columbia, have invented a new and useful Sound-Conveying Tube for Talking-Machines.

The invention about to be set forth and claimed belongs to the art of acoustics, and it particularly pertains to a new and useful sound-conveying tube having a joint located at a point between the free ends thereof, and adapted for use upon talking machines and the like; and the object of the invention is to improve and simplify the structure shown, set forth and claimed in the Patent No. 859,165.

A further object of the invention is to provide an amplifying horn having a flexible ball joint breaking at a point between the free ends thereof, said ball having means to be engaged by the parts of the amplifying horn, for the purpose of retaining them in their proper correlative positions, and in order to allow them to have universal movements.

A further object of the invention is to provide the ball and one of the parts of the amplifying horn with means, by which the said parts may be held in raised positions, as desired.

In the exposition of this specification, a particular design of machine is adhered to but the invention is not to be confined to this special design. Its reduction to practice may require certain changes and alterations which the right is claimed to make, provided such changes and alterations are comprehended by the appended claims.

With the above described objects in view as well as others hereinafter set forth, the invention consists in the construction and combination of elements hereinafter described and pointed out in the claims.

Referring to the drawings: Figure 1 is a side elevation of a talking machine, showing an amplifying horn having a flexible ball joint breaking at a point between the free ends thereof. Fig. 2 is a vertical sectional view through the flexible ball joint, showing parts of the amplifying horn connected to the ball. Fig. 3 is a perspective

view of the upper half or part of the amplifying horn, showing the spherical flange to engage the ball of the joint. Fig. 4 is a perspective view of the lower half of the amplifying horn, or, in other words, the reproducer arm, also having a spherical flange to engage said ball.

In the drawings, 1 denotes the casing of a talking machine, containing the usual mechanism, (not shown) for rotating the table carrying the record.

2 is a bracket secured to one side of the casing for supporting the amplifying horn 3.

The amplifying horn comprises the horn proper 4 and the reproducer arm 5, which are joined together by the flexible ball joint 6. To the end 7 of the reproducer arm is attached the usual sound box 8, while the rear portion of the reproducer arm is provided with an upwardly curved elbow 9, to the upper end of which a spherical flange 10 is formed.

The amplifying horn proper is of the usual form having at the end opposite its flaring mouth an elbow 11, to the lower portion of which a spherical flange 12 is formed (which is similar to the flange 10); these flanges 10 and 12 are designed to engage separate bearings 13 and 14 of the spherical bearing member 15, as clearly shown in Figs. 1 and 2. This spherical bearing member or ball is provided with a central vertical bore or sound duct 16, which is designed to register (at times) with the sound ducts 17 and 18 of the amplifying horn proper and the reproducer arm. This spherical member may be integrally connected with the bracket, as shown in Fig. 1, or it may be a separate member detachably secured to the bracket 2, as shown clearly in Fig. 2, by means of a screw or other means 19, which penetrates through the upper part of the bracket and into the said member, as clearly shown. This spherical member or ball 15 is provided above and below with annular shoulders 20 and 21, which are designed to be engaged by the lips 22 and 23, which are formed with the spherical flanges 10 and 12. When the spherical flanges 10 and 12 are connected to the spherical member or ball, as shown clearly in Figs. 1 and 2, the lips 22 and 23 are arranged upon opposite sides

of said spherical bearing member or ball, in order to maintain the amplifying horn proper and the reproducer arm in connection with the said spherical member or ball, and in their proper correlative positions. The portion of the spherical bearing member or ball designated by the numeral 24, and between the annular shoulders 20 and 21, has its surface concentric with the center of the member or ball and the separate bearing surfaces 13 and 14 thereof.

Upon the rear portion of the surface between the said annular shoulders are formed shoulders 25 and 26, which are designed for the purpose of being engaged by the lip 22 of the flange 12, when it is desired to hold the amplifying horn proper in various raised positions, as shown clearly in dotted lines in Fig. 2. To dispose the amplifying horn proper in the position shown in dotted lines in Fig. 2, the said horn is swung directly at right angles to that shown in Fig. 2, and then slightly raised, thence returned to the position shown in dotted lines, which position is approximately in vertical alinement with the position seen in full lines, as will be clearly manifest.

When the reproducer arm is being slightly raised, for the purpose of changing the record, or changing the needle of the sound box, a suitable spring member 27 is provided, as shown in Fig. 2, to hold the flange 10 reasonably in close contact with the lower bearing surface 13 of the said member 15, in order to prevent displacement of the said arm. This member 27 may be made of any suitable metal, so long as it affords rigidity, sufficient to hold the reproducer arm in a raised position. To insure this feature of the invention, the said member 27 or the flange 10, or both, may be provided with roughened surfaces, as shown at 28 in Fig. 2.

In Fig. 4 the roughened surface 28 is dispensed with, as will be observed, and in Fig. 1 the member 27 is also not shown.

In Fig. 1, the shoulders 25 and 26 are dispensed with, and on the forward portion of the surface between the annular shoulders 20 and 21, a shoulder 29 is provided, which may be engaged by the lip 23 of the flange 10, when it is desired to support the reproducer arm in a raised position. This structure of device materially facilitates the connection of the amplifying horn proper and the reproducer arm (which is the fundamental principle and the object of this invention); for instance, an operator may connect the amplifying horn and the reproducer arm simultaneously to the spherical member by holding the amplifying horn proper in one hand and the reproducer arm in the other hand, and disposing these parts in an inclined position (while the flanges 10

and 12 are in close proximity to the spherical member or ball 15) so that the lips 22 and 23 are somewhat adjacent the annular shoulders 20 and 21, and in contact with the surfaces between the said shoulders, after which the amplifying horn proper and the reproducer arm are gradually lowered to the positions shown in full lines in Fig. 2, as will be clearly apparent.

From the foregoing, the essential features, elements and the operation of the device, together with the simplicity thereof, will be clearly apparent.

Having thus fully described the invention, what is claimed as new and useful is:—

1. A reproducer arm and horn; a spherical member having separate bearing surfaces and provided with means between the bearing surfaces to be engaged by the reproducer arm and horn in order to be maintained in position.

2. A spherical bearing member having annular shoulders; a reproducer arm and horn having means to engage said shoulders.

3. A spherical bearing member having annular shoulders; a reproducer arm and horn having means to engage said shoulders; said member having means to support the horn in a raised position.

4. A spherical bearing member having annular shoulders; a reproducer arm and horn having means to engage said shoulders; said member having means to support the arm in a raised position.

5. A spherical bearing member having annular shoulders; a reproducer arm and horn having lips to engage said shoulders.

6. A reproducer arm and horn having spherical members provided with lips; a spherical bearing member having means to be engaged by said lips.

7. An amplifying horn comprising a reproducer arm and horn; a flexible ball joint therebetween; said ball having annular shoulders; said reproducer arm and horn having means to engage said shoulders; said joint having means to support the arm and horn in various raised positions.

8. An amplifying horn; a flexible ball joint breaking at a point between its free ends and provided with means to be engaged by the adjacent connected ends of the horn; said joint having means to support the adjacent connected ends in various raised positions.

9. A talking machine; a reproducer arm and horn therefor; a flexible ball joint connected therebetween; said reproducer arm and horn having spherical members provided with lips; said ball having means to be engaged by said lips; said joint having means to support the arm and horn in various raised positions.

10. A talking machine; a reproducer arm

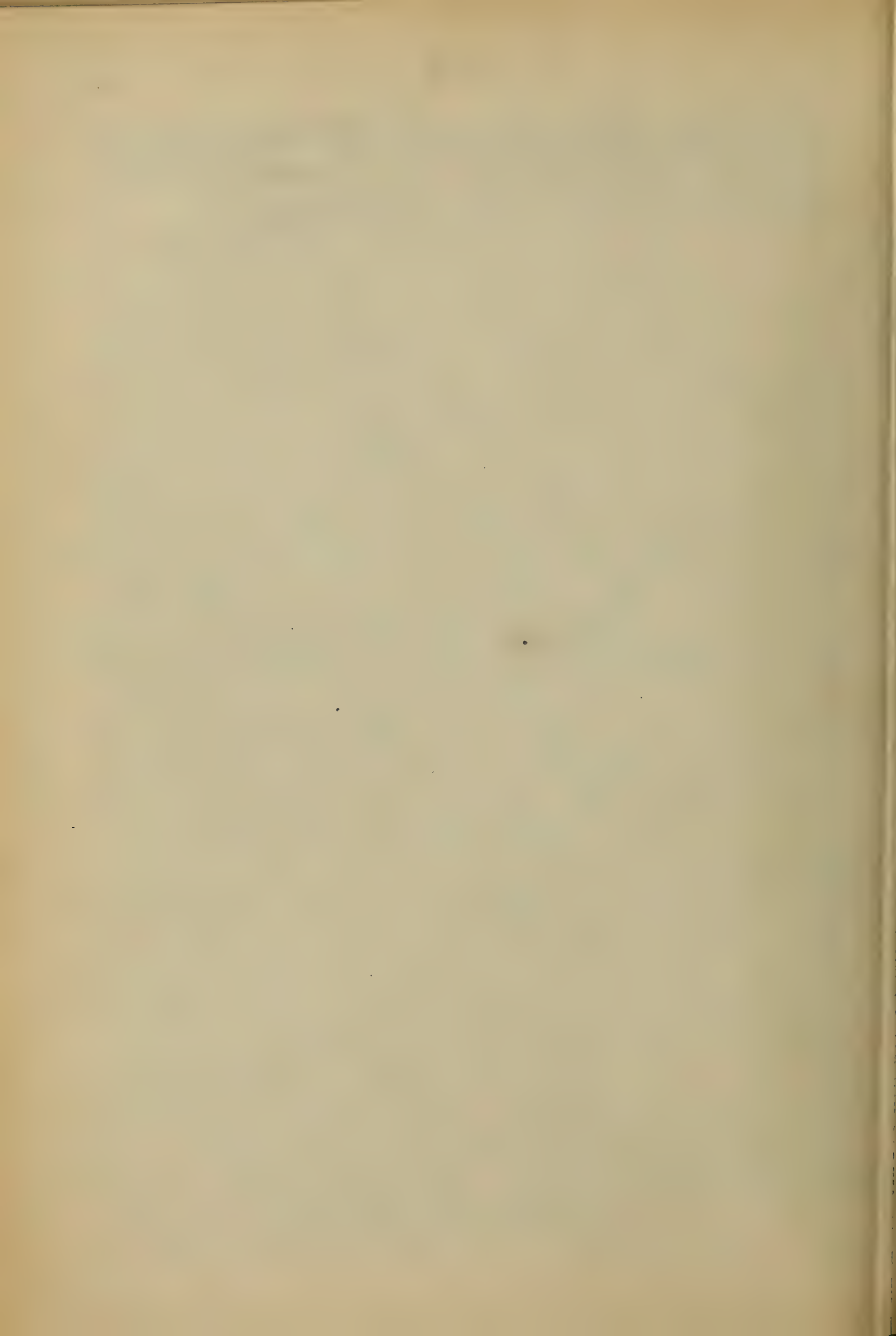
and horn therefor; a flexible ball joint connected therebetween; said reproducer arm and horn having spherical members provided with lips; said ball having annular
5 shoulders to be engaged by said lips; said joint having means to support the arm and horn in various raised positions.

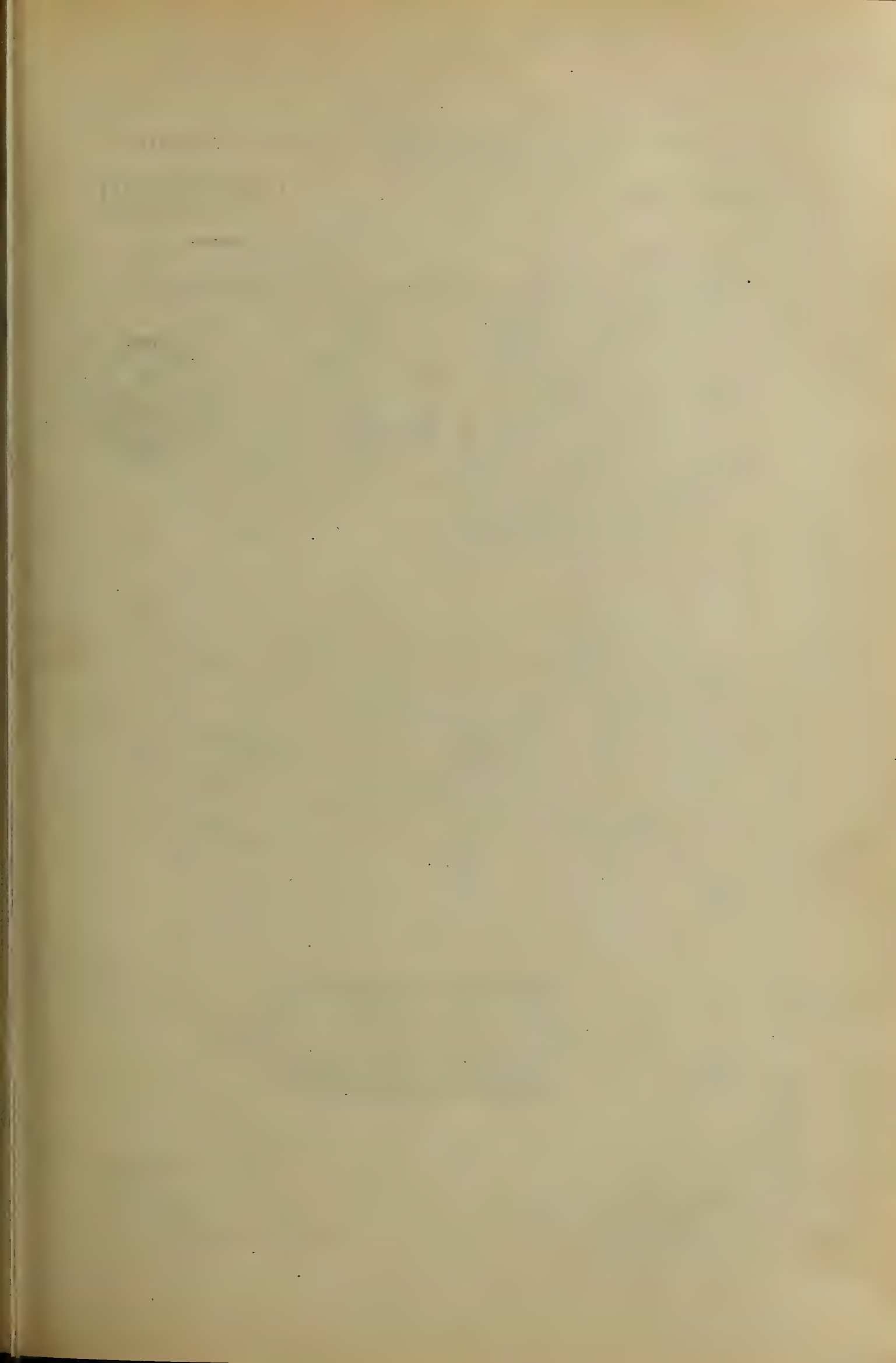
In witness whereof, the applicant's signature, is hereunto affixed in the presence of two witnesses.

ROBERT A. BOSWELL.

Witnesses:

G. PERCY MCGHEE,
GEORGE I. BORGER.



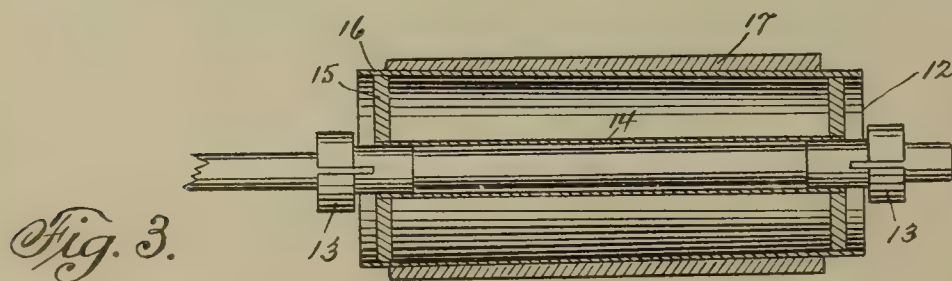
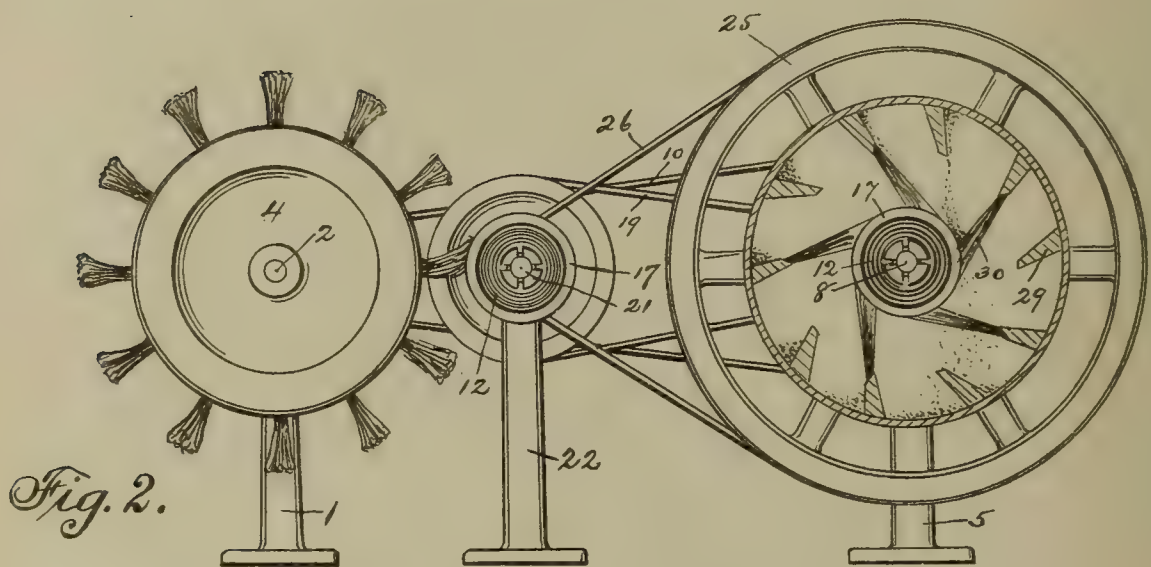
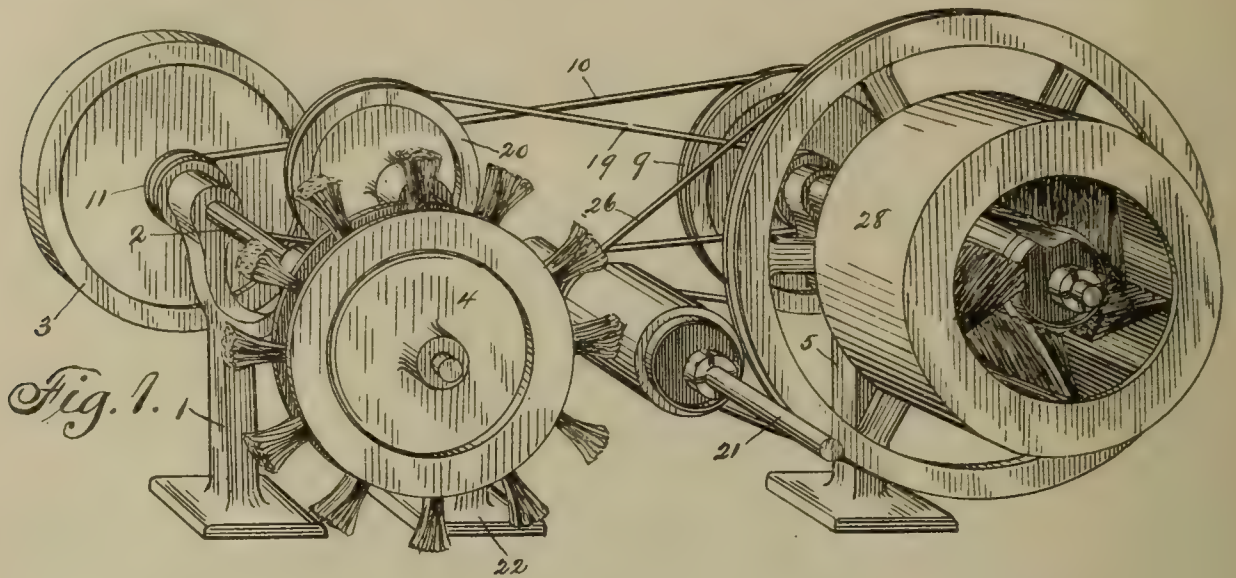


I. W. NORCROSS.
 APPARATUS FOR COATING SOUND RECORDS WITH ELECTROCONDUCTIVE MATERIAL.
 APPLICATION FILED NOV. 13, 1909.

952,753.

Patented Mar. 22, 1910.

2 SHEETS—SHEET 1.



Witnesses:

Henry Meyer

Isaac W. Norcross
 Inventor

By his Attorney, J. C. Edwards

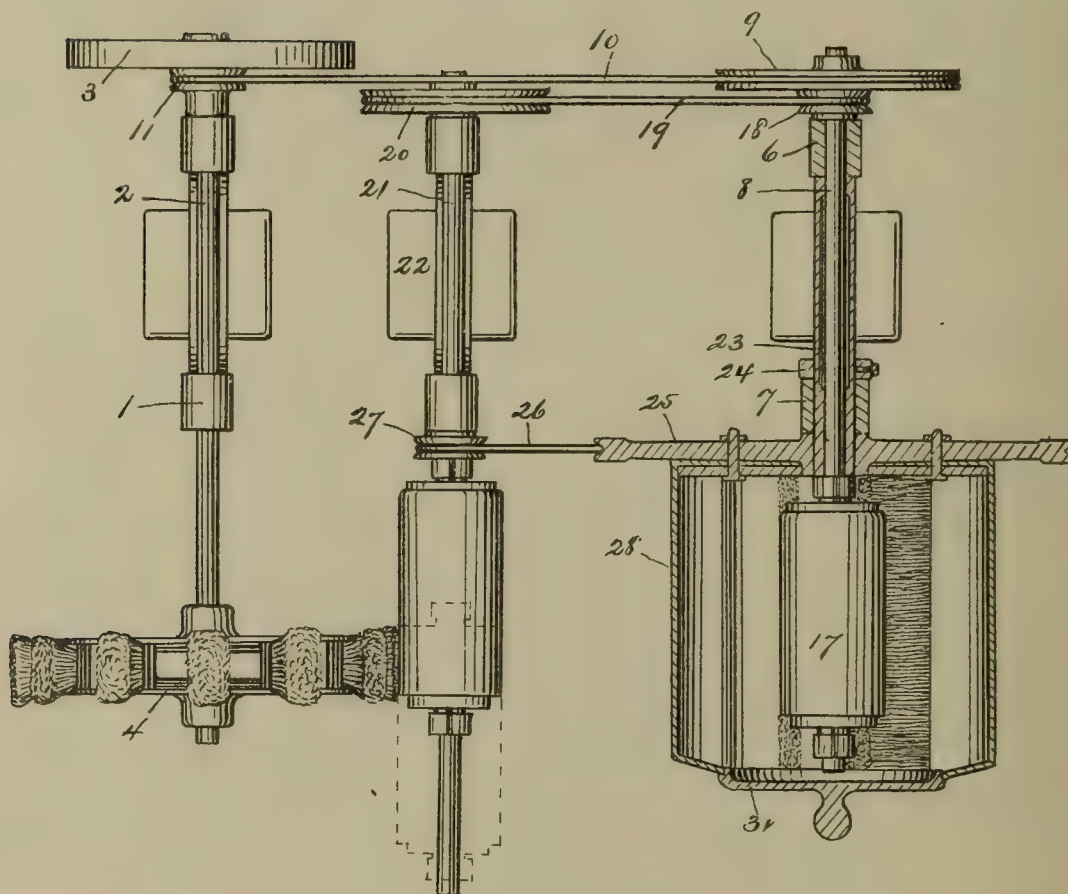
I. W. NORCROSS.
 APPARATUS FOR COATING SOUND RECORDS WITH ELECTROCONDUCTIVE MATERIAL.
 APPLICATION FILED NOV. 13, 1909.

952,753.

Patented Mar. 22, 1910.

2 SHEETS—SHEET 2.

Fig. 4.



Witnesses:
H. Edwards
Harry Meyer

Isaac W. Norcross
 Inventor.

By his Attorney *J. H. Edwards*

UNITED STATES PATENT OFFICE.

ISAAC W. NORCROSS, OF NEW YORK, N. Y.

APPARATUS FOR COATING SOUND-RECORDS WITH ELECTROCONDUCTIVE MATERIAL.

952,753.

Specification of Letters Patent. Patented Mar. 22, 1910.

Application filed November 13, 1909. Serial No. 527,764.

To all whom it may concern:

Be it known that I, ISAAC W. NORCROSS, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Apparatus for Coating Sound-Records with Electroconductive Material, of which the following is a specification.

This invention relates to the art of making sound-records and has reference particularly to the production of numerous duplicates from an original or master record.

The invention is directed to that portion of the operation of making duplicate sound-records from an original which consists in preparing the surface of the original record by coating it with an electro-conductive substance so that a matrix may be made thereon by electro-plating. Original sound-records are commonly formed of a waxy substance and in order to form a matrix on this original it is common to provide a coating of graphite upon the surface of the original record to make its surface conductive prior to putting the record in the electro-plating bath.

Heretofore it has been the practice to apply graphite to the surface of a sound-record manually with a camel's-hair brush by wiping the brush against the record at one point and then another repeatedly to coat the record with the graphite and rub the latter into the grooves of the record as thoroughly as possible. The application of the graphite to the surface of the original record in this way has not been satisfactory both because of the character of the results obtained and because of the amount of time required, and it is the object of my present invention to provide an improved process and apparatus whereby this step in the manufacture of sound-records may be performed in a much superior manner and in much less time than is required under the method heretofore employed.

My invention consists in loading the surface of an original sound-record with the electro-conductive material and then, in an operation distinct from the loading operation, burnishing the surface of the record. I find that in this way a very much superior coating of the material is obtained, this coating having a bright, burnished surface similar to an enamel. Furthermore, the particles of the graphite are so closely laid

upon the surface of the record that the coating is impervious to moisture; this is an advantage of considerable importance for the record after being coated must be placed in the electro-plating bath and if the water of the bath finds its way through the graphite coating, the record is quite apt to be spoiled by the water coming in contact with alkali in the sound-record and forming what is known as a "soda spot." Furthermore, the coating of graphite obtained in accordance with my invention is such that the coated record may be handled with little danger of affecting the coating thereon whereas with records coated under the process heretofore commonly employed, great care had to be exercised to keep from touching the surface of the coated record.

My invention comprises the process above outlined independent of the apparatus which may be employed in practicing the invention. I have, however, shown in the accompanying drawings an apparatus which may be employed and which I prefer to employ.

In these drawings Figure 1 is a perspective view of the apparatus, Fig. 2 is an elevation of the same with one member in vertical section, Fig. 3 is a sectional view of the mandrel and Fig. 4 is a plan view of the machine with one of the parts shown in horizontal section.

Referring to these drawings, 1 indicates a standard having therein bearings for a shaft 2 on the end of which is mounted a pulley 3 by which rotary motion is communicated to the shaft 2. On the opposite end of the shaft 2 is secured a wheel 4 having a plurality of bunches of camel's-hair secured thereto so as to form a rotary camel's-hair brush. A second standard 5 has bearings formed therein, as shown at 6 and 7 (Fig. 4), for a shaft 8 on one end of which is mounted a pulley 9; a belt 10 runs on this pulley and on a pulley 11 upon the shaft 2 to transmit rotary motion from the latter shaft to shaft 8. The end of the shaft 8 opposite that to which the pulley 9 is secured is adapted to receive a mandrel 12, shown in detail in Fig. 3. This mandrel consists of two tubular pieces 13, a tube 14 connecting them, heads 15 on the tube 14 and a cylindrical piece 16 supported by the heads 15 and adapted to receive a cylindrical sound-record 17 as shown. The tubular pieces 13 are slotted and so formed as to exert a clamping action upon the shaft 8 when

the mandrel with a sound-record thereon is inserted over the forward end of the shaft 8. The shaft 8 also carries a pulley 18 on which runs a belt 19 which by means of the pulley 20 communicates rotary motion to a shaft 21 mounted in bearings formed in a standard 22. The forward end of the shaft 21 is adapted to receive the mandrel 12 and sound-record thereon just as the shaft 8 is, and when the sound-record is thus supported upon shaft 21, its surface is engaged by the rotary brush 4.

Surrounding a portion of the shaft 8 is a sleeve 23, the bearing 7 being enlarged to receive this sleeve and to permit rotation thereof independently of the shaft 8. Sleeve 23 is positioned by a collar 24 secured thereon and pulley 25 is secured to the sleeve 23 and receives a belt 26 which also runs upon a pulley 27 secured upon the shaft 21. To the pulley 25 is secured a cylindrical member 28 having a plurality of carriers 29 projecting inwardly thereof. To certain of these carriers may be secured bunches of camel's-hair 30 projecting inwardly so that their ends may engage a sound-record supported upon the shaft 8. A cover 31 may be provided whereby the end of the cylindrical member 28 may be closed when desired. The power connections between the various parts are such that the cylindrical member 28 rotates quite slowly while the shaft 8 carrying the record within the cylindrical member rotates at a very considerably higher speed. These two parts are shown as rotating in the same direction though this is not essential. The speeds which I prefer to employ are four rotations a minute for the cylindrical member 28 and one hundred revolutions a minute for the shaft 8. The brush 4 is made to rotate at very high speed preferably as much as four hundred revolutions per minute and the shaft 21 carrying the record with which the brush 4 coacts, is made to rotate in the same direction as the brush 4 at a speed which is preferably forty revolutions per minute.

In the operation of coating the surface of the cylindrical sound-record the record is first placed upon a mandrel 12 and this mandrel is then inserted upon the forward end of the shaft 8. This may be done while the mechanism is in operation for the mandrel slips readily upon the shaft 8 and then grips the latter sufficient to cause the rotation of the mandrel. A small amount of graphite is then inserted within the cylindrical member 28 and if desired the cover 31 may be placed in position. As the member 28 rotates the graphite is carried up by the carriers 29 and then deposited upon the upper surface of the sound-record 17. The sound-record is then rotating in the same direction but at a very much higher speed than the member 28, and the particles of graphite

will therefore be drawn under the brushes 30 by the rotation of the record and caused to adhere to the surface of the record. This operation is continued until a sufficient quantity of the graphite is loaded upon the surface of the record. The operator then grips the end of the mandrel and draws the latter with the record thereon off from the end of the shaft 8. Preferably, the mandrel and record are then turned around and inserted upon the shaft 8 in the reverse position in order to insure a thorough loading of the record. After this the mandrel and record are withdrawn and placed in a similar manner upon the forward end of the shaft 21. When the record is taken from within the member 28, its surface is covered with a loose, dull coating of graphite in granular form. When the record is placed upon the shaft 21 it is caused to rotate and the brush 4 also rotates in such position that the ends of the delicate bristles of camel's-hair engage the surface of the record. Because of the rotation of the shafts 2 and 21, the speed of the rubbing contact of the brushes 4 with the surface of the sound-record on shaft 21 is very high. The particles of graphite upon the record are thus compacted and caused to lie close together and to the surface of the record; furthermore, the coating of the graphite is burnished so that it has a bright, smooth surface resembling an enamel and such that the coating is impervious to moisture and will not be materially affected if touched with the fingers. If desired, the mandrel 12 with the record thereon may be moved manually upon the shaft 21 so that the brush 4 will contact with the record over the entire surface of the latter; in practice, however, I find that it is only necessary to move the mandrel in one direction manually as it works along in the opposite direction automatically. After the record has been brushed in this way for a short time, it is desirable to reverse it upon the shaft 21 as this insures getting the graphite well into the portions of the record-groove which are inclined at such an angle that the brush 4 could not act efficiently thereon when the record was in its original position.

It will thus be seen that the method of making the surface of a sound-record electro-conductive herein described, differs essentially from that heretofore employed in that there are two distinct operations, first the loading of the surface of the sound-record, and second, an operation distinct from the loading operation and consisting of burnishing the material which was loaded upon the surface of the record. The difference between coatings obtained by the two processes is readily discernible by the naked eye and it is apparent in that in the one case if the record be touched with the finger a

substantial quantity of the graphite will adhere thereto, whereas, in the other case touching the record has no appreciable effect. Furthermore, the coating obtained in accordance with this process is impervious to moisture to a very much greater degree and therefore the danger of spoiling an original record in the electro-plating bath is greatly reduced. The cost of producing coated records is also reduced since the time required for a coating operation in the process and apparatus above described is greatly reduced from that required under the process heretofore employed, particularly as it will be seen that two records may be operated upon at the same time, one being loaded while the other is being burnished.

Having described my invention what I claim as new therein and desire to secure by Letters Patent is:

1. The combination of a support for a sound-record, means for loading the surface of the sound-record on said support with an electro-conductive material, a brush, and means for causing relative rotation of the brush and record while in contact to burnish the surface of the record, substantially as set forth.

2. The combination of a support for a sound-record, means for loading the surface of the sound-record on said support with an electro-conductive material, a second support for a sound-record, a brush adjacent to said second support and adapted to contact with the surface of a record thereon, and means for rotating said second support, substantially as set forth.

3. The combination of a support for a sound-record, a rotary member surrounding the sound-record on said support, means for rotating said member, carriers on said member for carrying electro-conductive material and depositing it on the sound-record, brushes adapted to coact with the sound-record, and means for causing relative rotation of the brushes and the sound-record, substantially as set forth.

4. The combination of a support for a sound-record, a rotary member surrounding the sound-record on said support, means for rotating said member, carriers on said member for carrying electro-conductive material and depositing it on the sound-record, brushes adapted to coact with the sound-record, and means for rotating the sound-record in a direction to draw the material deposited thereon under the said brushes, substantially as set forth.

5. The combination of a support for a sound-record, a rotary member surrounding

the sound-record on said support, means for rotating said member, carriers on said member for carrying electro-conductive material and depositing it on the sound-record, brushes mounted on said member and engaging the surface of a sound-record on said support, and means for rotating said support with the sound-record thereon, substantially as set forth.

6. The combination of a support for a sound-record, a rotary member surrounding the sound-record on said support, means for rotating said member, carriers on said member for carrying electro-conductive material and depositing it on the sound-record, brushes adapted to coact with the sound-record, means for causing relative rotation of the brushes and the sound-record, a second support for a sound-record, a brush mounted adjacent thereto, and means for rotating said brush, substantially as set forth.

7. The combination of a support for a sound-record, a rotary member surrounding the sound-record on said support, means for rotating said member, carriers on said member for carrying electro-conductive material and depositing it on the sound-record, brushes adapted to coact with the sound-record, means for rotating the sound-record in a direction to draw the material deposited thereon under the said brushes, a second support for a sound-record, means for rotating the same, a brush mounted adjacent to the record on said second support so as to contact therewith, and means for rotating said last-named brush, substantially as set forth.

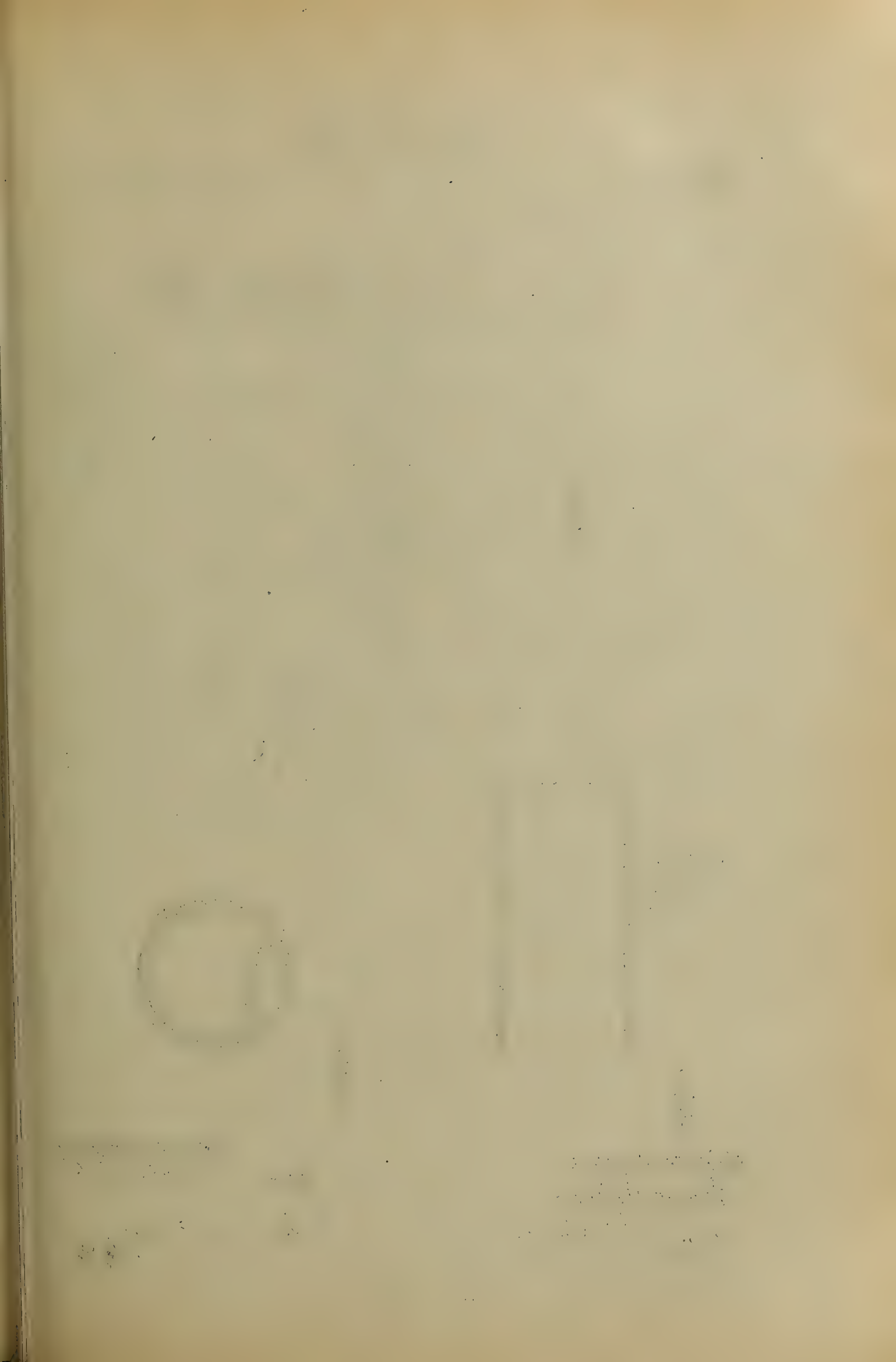
8. The combination of a support for a sound-record, a rotary member surrounding the sound-record on said support, means for rotating said member, carriers on said member for carrying electro-conductive material and depositing it on the sound-record, brushes mounted on said member and engaging the surface of a sound-record on said support, means for rotating said support with the sound-record thereon, a second support for a sound-record, a brush mounted adjacent thereto and adapted to contact with the record on said support, and means for rotating said last-named support and brush, substantially as set forth.

This specification signed and witnessed this 8th day of November, 1909.

I. W. NORCROSS.

Witnesses:

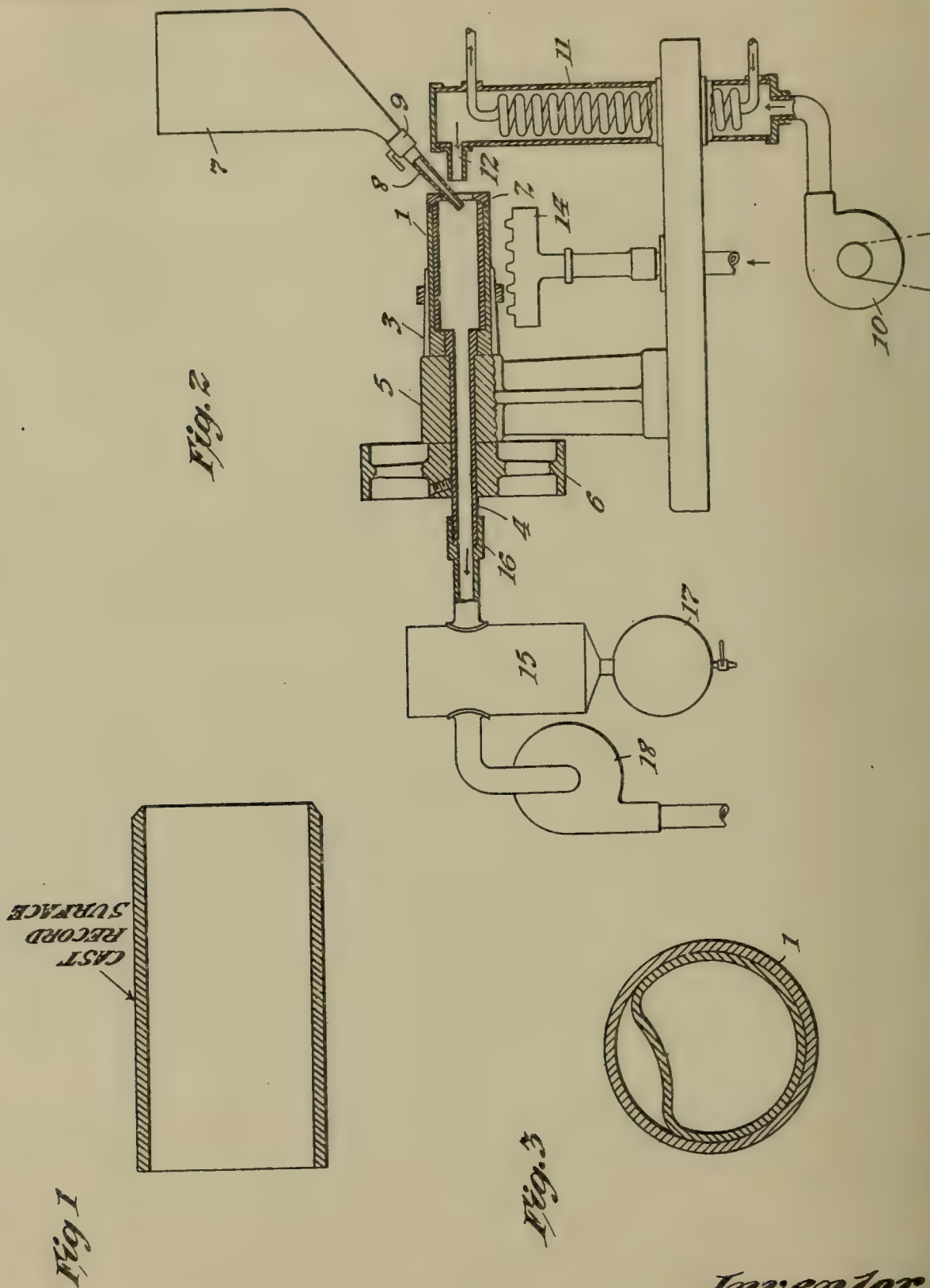
D. S. EDMONDS,
HENRY MEYER.



J. W. AYLSWORTH.
 DUPLICATE SOUND RECORD.
 APPLICATION FILED JUNE 16, 1906.

953,454.

Patented Mar. 29, 1910.



Witnesses:
 Frank D. Lewis
 Anna R. Klehm

Inventor:
 James W. Aylsworth
 by Frank L. Hyer
 Atty.

UNITED STATES PATENT OFFICE.

JONAS W. AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

DUPLICATE SOUND-RECORD.

953,454.

Specification of Letters Patent. Patented Mar. 29, 1910.

Application filed June 16, 1906. Serial No. 322,078.

To all whom it may concern:

Be it known that I, JONAS W. AYLSWORTH, a citizen of the United States, residing at 223 Midland avenue, East Orange, county
5 of Essex, and State of New Jersey, have invented certain Improvements in Duplicate Sound-Records, of which the following is a description.

My invention relates to improvements in
10 duplicate sound records.

In Patent No. 855,555, granted June 4, 1907, I describe a process for making duplicate sound records of celluloid, collodion, cellulose acetate, pyroxylin and similar solid
15 materials, which during the process of manufacture are maintained in a state of solution, the solvent being evaporated after the solution has been uniformly distributed over the bore of the matrix so as to take an impression therefrom and being maintained intimately in engagement with the matrix by
20 rapidly rotating the same so as to develop centrifugal force. As I point out in said patent, duplicate sound records made of
25 these materials by the improved process are superior to those heretofore made in the respects, first, that the impression obtained is provided with a true cast surface, the material having no tendency to change its
30 condition or form, and therefore retaining the record impression unimpaired for an indefinite time; and second, that the record can be made of any desired thickness with
35 being no tendency whatever to flake or scale off.

The purpose of the present application is to describe and claim the improved sound record as a new article of manufacture. As
40 such, the invention may be defined as a duplicate sound record formed of celluloid (in which term I include all so-called indestructible materials for the purpose, such as collodion, pyroxylin and cellulose acetate)
45 and having homogeneous or non-laminated walls and with a cast permanent record surface, as distinguished from one in which the material is merely distorted or displaced.

In order that the invention may be better understood, attention is directed to the accompanying drawing, forming part of this specification and in which—

Figure 1, is a longitudinal sectional view of my improved record, Fig. 2, a diagrammatic view of a suitable apparatus for pro-

ducing the same, and—Fig. 3, a cross-sectional view through the matrix showing one way of removing the finished records therefrom.

In all of the above views corresponding
60 parts are represented by the same numerals of reference.

The matrix 1 is provided on its interior with the record surface in relief and is obtained in any suitable way, preferably by a
65 process of vacuous deposit, as is common in the art. It may be provided with an end flange 2, carrying the engraved matter for identifying the record. A chuck 3 is shown for rotating the matrix at the desired high
70 speed, said chuck being carried at the end of a hollow shaft 4, mounted in a bearing 5, and rotated by a pulley 6. The solution of the celluloid-like material is maintained in a tank 7, from which a spout or nozzle 8 leads
75 to the matrix, a gate valve 9 being provided for controlling the flow of solution through the same.

In order to evaporate the solvent from the solution within the matrix, I show a fan
80 10, connected to a chamber 11, from which extends an outlet 12 leading directly to the matrix. A steam coil is provided within the chamber 11 for the purpose of heating
85 the air, so as to facilitate the evaporation. A nozzle 14 may be located outside of the matrix for supplying a hot blast to the same to effect the evaporation. In order to recover the solvent I illustrate a condenser
90 15 connected by a coupling 16 with the hollow shaft 4, and provided with a tank 17 beneath it, in which the condensed solvent may be collected. A suction fan 18 may be connected to the condenser to effect the circulation of hot air, although this fan may
95 be dispensed with if the blower 10 is of sufficient capacity.

In obtaining duplicate sound records I employ a solvent of a celluloid-like material, for instance, pyroxylin dissolved in
100 acetone, which solution is maintained within the tank 7. The solution should not be too viscid, because in that condition it will not flow readily and will not take a good impression, but may be of about the consistency of molasses to give good results. The matrix being rotated at the desired high
105 speed, a sufficient charge of the solution is allowed to enter the matrix and will be uniformly distributed over the bore of the lat-

110

ter by reason of the centrifugal force developed. In thus being distributed it will drive inwardly any air bubbles which may be entrapped thereby, so as to result in a
5 very perfect and accurate impression of the record surface being secured. This distribution of the material, of course, will be effected within a few seconds. The blower
10 is now operated so as to drive a blast of warm air through the matrix, and if desired, the matrix may be heated exteriorly by the blast 14. By thus heating the solution while the matrix is still rotating at the
15 desired speed, the solvent will be very rapidly driven off and will be separated by the condenser 15 and collected in the tank 17. When the solvent has been entirely evaporated the resulting record will be obviously
20 formed of the desired celluloid-like material, the thickness of which will depend upon the amount of the solution originally introduced within the matrix. In every event, the record will be continuous, homogeneous and non-laminated throughout, ir-
25 respective of the thickness of its walls, and the record surface will be impressed therein by a true casting operation, so that there will be no tendency to change or alter the configuration thereof.
30 It will be understood that the records can be made of a celluloid-like material to which has been added more or less of a soluble adulterant, such as castor oil or camphor, and also, that two or more celluloid-
35 like materials may be used together in a common menstruum. After the record has

been finished, it may be removed from the matrix by first dipping the latter in hot water, so as to soften the record slightly and permit it to be collapsed inwardly as
40 shown in Fig. 3, or, if its walls are too thick to be readily collapsed, the matrix may be cooled to a sufficient extent to cause the record to shrink radially and thus detach itself and permit of its removal. 45

Having now described my invention, what I claim as new and desire to secure by Letters Patent is as follows:—

1. As a new manufacture, a duplicate sound record made of cellulose ester having
50 homogeneous and non-laminated walls and with a cast sound record on its exterior, substantially as and for the purposes set forth.

2. As a new manufacture, a duplicate sound record made entirely of cellulose ester,
55 having homogeneous and non-laminated walls, free from internal stress, and of sufficient thickness to be sufficiently stiff, and with a cast sound record on its exterior, substantially as set forth. 60

3. As a new manufacture, a duplicate sound record made of a nitro derivative of cellulose, having homogeneous and non-laminated walls, and with a cast sound record on its exterior, substantially as set forth. 65

This specification signed and witnessed this 2nd day of June 1906.

JONAS W. AYLSWORTH.

Witnesses:

FRANK L. DYER,
ANNA R. KLEHM.

E. P. SHEPARD.
SOUND MODIFIER FOR TALKING MACHINES.
APPLICATION FILED SEPT. 21, 1909.

953,557.

Patented Mar. 29, 1910.

Fig. 1.

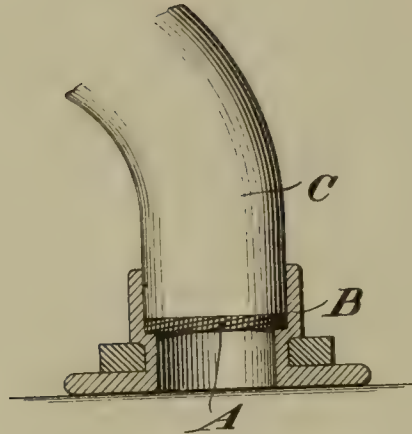


Fig. 2.

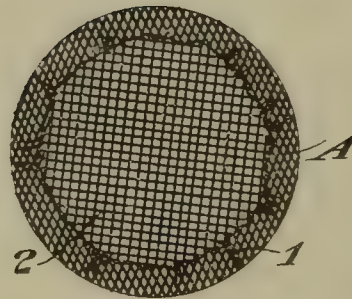
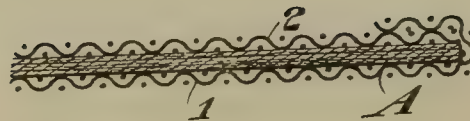


Fig. 3.



Witnesses

Lloyd W. Patch

M. Ray Taylor.

Inventor

Edward P. Shepard

By

Vernon E. Dodge
his Attorney

UNITED STATES PATENT OFFICE.

EDWARD P. SHEPARD, OF SAN DIEGO, CALIFORNIA.

SOUND-MODIFIER FOR TALKING-MACHINES.

953,557.

Specification of Letters Patent. Patented Mar. 29, 1910.

Application filed September 21, 1909. Serial No. 518,846.

To all whom it may concern:

Be it known that I, EDWARD P. SHEPARD, a citizen of the United States, residing at San Diego, in the county of San Diego and State of California, have invented certain new and useful Improvements in Sound-Modifiers for Talking-Machines, of which the following is a specification.

My invention relates to an improvement in sound modifiers for talking machines, and its object is to provide means whereby the sound can be modified or reduced without in anywise producing a detrimental muffling effect.

The invention consists of certain novel features of construction and combination of parts to be hereinafter described and pointed out in the claims.

In the accompanying drawings, Figure 1 is a fragmentary view of the goose-neck of a talking machine, showing the invention applied, Fig. 2 is a plan view of the modifier, and Fig. 3 is a sectional view of the same.

A represents the sound modifier, which may be located within the sleeve B by which the sounding box is attached to the goose-neck C, or within any equivalent part of the talking-machine.

The modifier is composed of two wire-gauze disks 1 and 2, the disk 2 being of less diameter than the disk 1, and interposed between the disks is one or more layers of fabric such as silk, which allows the sound waves to readily pass without affecting the sound with the exception of reducing or

modifying it. The layers of silk or other fabric are of the same diameter as the disk 2, and as the fabric is placed between the disks the outer edges of the disk 1 are brought around or folded upon the disk 2, whereby the fabric is retained between the disks and the two disks are connected together.

From the foregoing, it will be seen that I have provided a simple means for modifying the tone of the sound-waves which is easy to construct and in which all of the parts are firmly held together.

Having thus described my invention, what I claim as new and desire to secure by Letters-Patent, is:

1. A sound modifier for talking-machines comprising a disk, a layer of fabric received on the disk and the edges of the disk folded over for retaining the fabric upon the disk.

2. A sound modifier for talking-machines comprising a large and a small disk, a layer of fabric interposed between the two disks and the edges of the larger disk being folded over upon the smaller disk for connecting the smaller disk and fabric together.

In testimony whereof I affix my signature, in the presence of witnesses.

EDWARD P. SHEPARD.

Witnesses:

A. E. DODSON,
EDWARD A. HICKS,
A. V. SHEPARD.

C. ZARR.
 DIAPHRAGM.
 APPLICATION FILED OCT. 16, 1909.

Patented Apr. 5, 1910.

953,889.

FIG. 4.

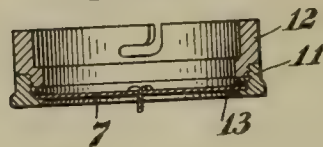


FIG. 1.

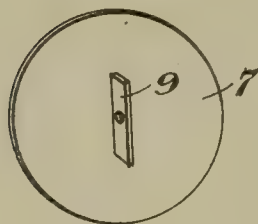


FIG. 2.

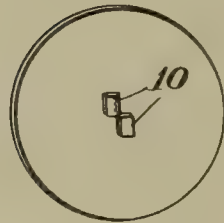


FIG. 3.

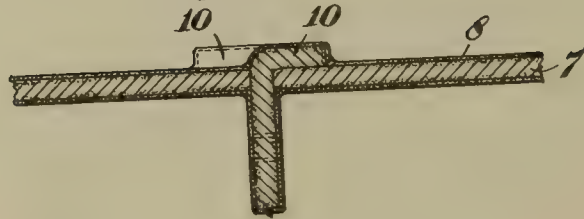
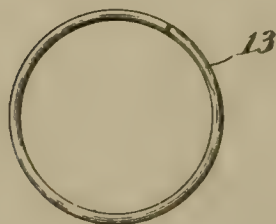


FIG. 5.



Witnesses:
Skuman
H. D. Penney

Inventor:

Clark Zarr,

By his Attorney,

F. H. Richards

UNITED STATES PATENT OFFICE.

CLARK ZARR, OF NEWBERRY, PENNSYLVANIA.

DIAPHRAGM.

953,889.

Specification of Letters Patent.

Patented Apr. 5, 1910.

Application filed October 16, 1909. Serial No. 522,934.

To all whom it may concern:

Be it known that I, CLARK ZARR, a citizen of the United States, residing in Newberry, in the county of Lycoming and State of Pennsylvania, have invented certain new and useful Improvements in Diaphragms, of which the following is a specification.

This invention relates to diaphragms for sound conveying instruments and is particularly applicable to use in talking machines.

The object of the invention is to provide a diaphragm which will transmit the human voice, instrumental music and other sounds without detracting from the tonal qualities or adding any unpleasant sounds. The diaphragm will be made of suitably prepared and treated fiber sheet material. If a center post is employed this may be made of similar material. The fibrous sheet material diaphragm and post may be assembled and fastened together by a coating of some resilient waterproof material. In practice the diaphragm may have applied to it a gasket of yieldable material to prevent the parts which will normally clamp the diaphragm in position interfering with the proper working of the diaphragm.

In the drawings accompanying and forming a part of this specification Figure 1 is a perspective view showing one side of my improved diaphragm, namely the lower or post carrying side. Fig. 2 is a similar view of the other or upper side of the diaphragm. Fig. 3 is a broken away enlarged central cross sectional view of the diaphragm and center post. Fig. 4 is a central sectional view of a sound box illustrating the diaphragm and gasket in position; and Fig. 5 is a perspective view of a form of gasket which may be employed with the diaphragm.

The body portion 7 of the diaphragm will be made from some suitable fibrous sheet material, as for instance paper of the required thickness and stability. The diaphragm, preferably after being cut to size, will be coated with some resilient material 8, which will be incorporated to a certain extent with the fiber of which the diaphragm is made, particularly at the surface. This is illustrated by the stippling in Fig. 3.

The diaphragm of my present improvement is adapted for use in all sound conveying instruments, and is particularly useful in talking machines. When used for a

talking machine a center post will be provided for connecting the diaphragm with the other parts of the mechanism. In the present instance the center post 9 is illustrated as made of sheet material, preferably the same kind of sheet material as is the diaphragm. The post carries two prongs 10—10 which pass through a suitable opening in the center of the diaphragm and are bent over, see more particularly Fig. 3. After the center post prongs have been passed through the diaphragm and bent over in the proper position for holding the center post in place the waterproof coating material will be applied to the entire structure and properly treated and cured. The waterproofing material will not only serve its purpose as such; but will also secure the prongs and the center post in rigid relation to the diaphragm. The fibrous sheet material and coating of resilient waterproof material together give a diaphragm which responds to or produces sound vibrations without adding any undersirable tone qualities thereto or detracting in any way from the sounds which are transmitted. The center post being of the same material as is the diaphragm and treated in the same manner, and being securely held in position assists the diaphragm in the performance of its work.

It will be noted in the drawings that the center post 9 is of sheet material applied to a diaphragm of sheet material with its edge resting against the face of the diaphragm.

In Fig. 4 there has been illustrated a form of sound box carrying my improved diaphragm. The box is shown as made up of two members 11 and 12 clamping the diaphragm in position between them by means of the gasket 13, which gasket in practice will be of some yieldable material, as for instance lead wire. By having a yieldable gasket the diaphragm may be securely clamped in position without placing undue strain upon the diaphragm or permitting any movement of the diaphragm which would interfere with the sound.

Having described my invention I claim:

1. A diaphragm composed of sheet fibrous material, a center post of similar material carried by one side of the diaphragm and having securing prongs entering through the diaphragm and bent over against the other side thereof, and a waterproof resili-

ent coating upon said diaphragm, center post, and securing prongs and securing these together, substantially as specified.

2. A diaphragm composed of sheet fibrous material, a center post of similar material carried by the diaphragm, a waterproof coating surrounding the diaphragm and the

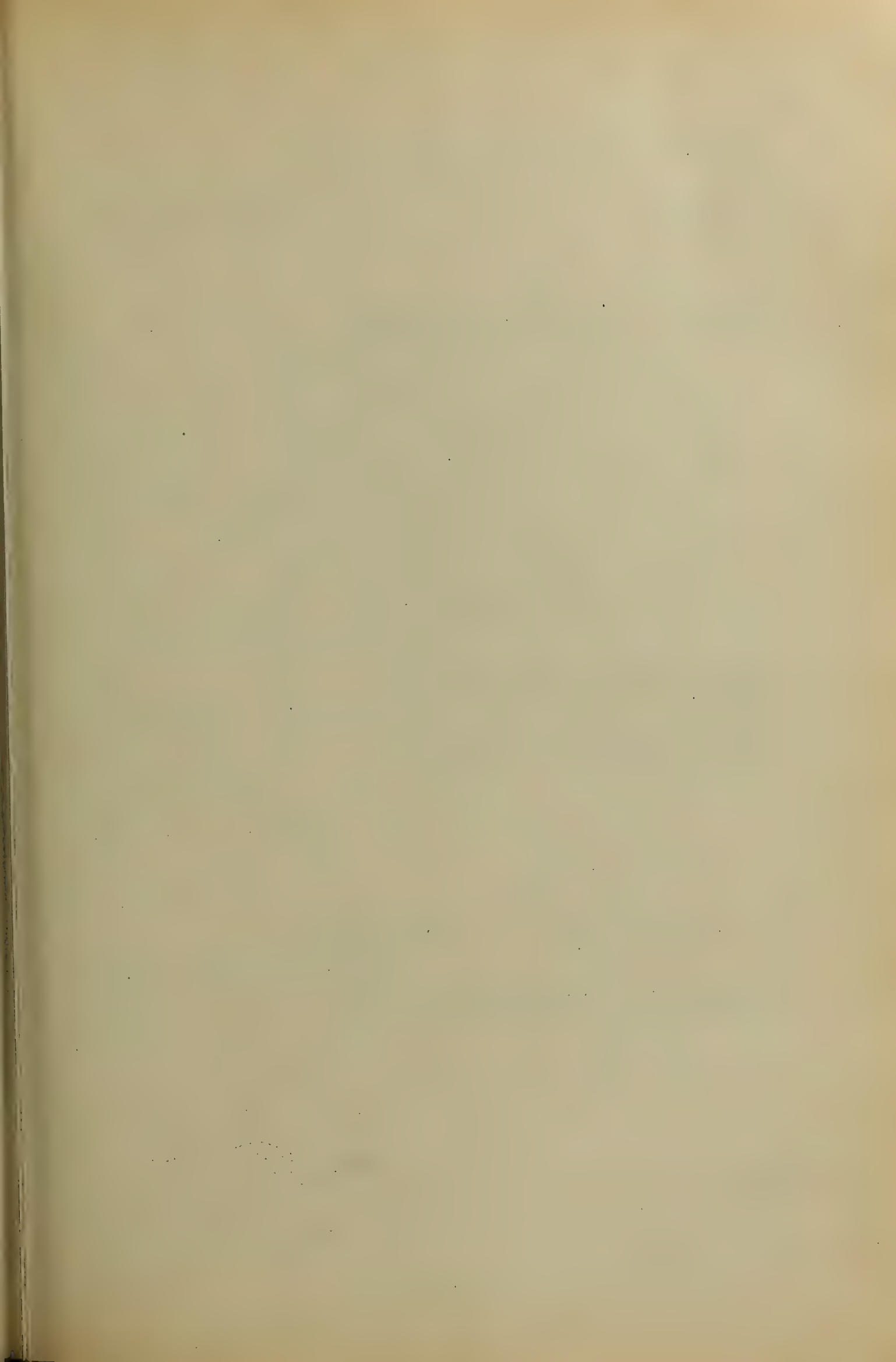
center post and securing these together, and a gasket of lead wire at the edge of the diaphragm.

CLARK ZARR.

Witnesses:

WM. SHELLERY,

HARRY WINTER.



W. S. McNAMARA.
ATTACHMENT FOR TALKING MACHINES.
APPLICATION FILED OCT. 6, 1909.

954,455.

Patented Apr. 12, 1910.

2 SHEETS—SHEET 1.

FIG. 1

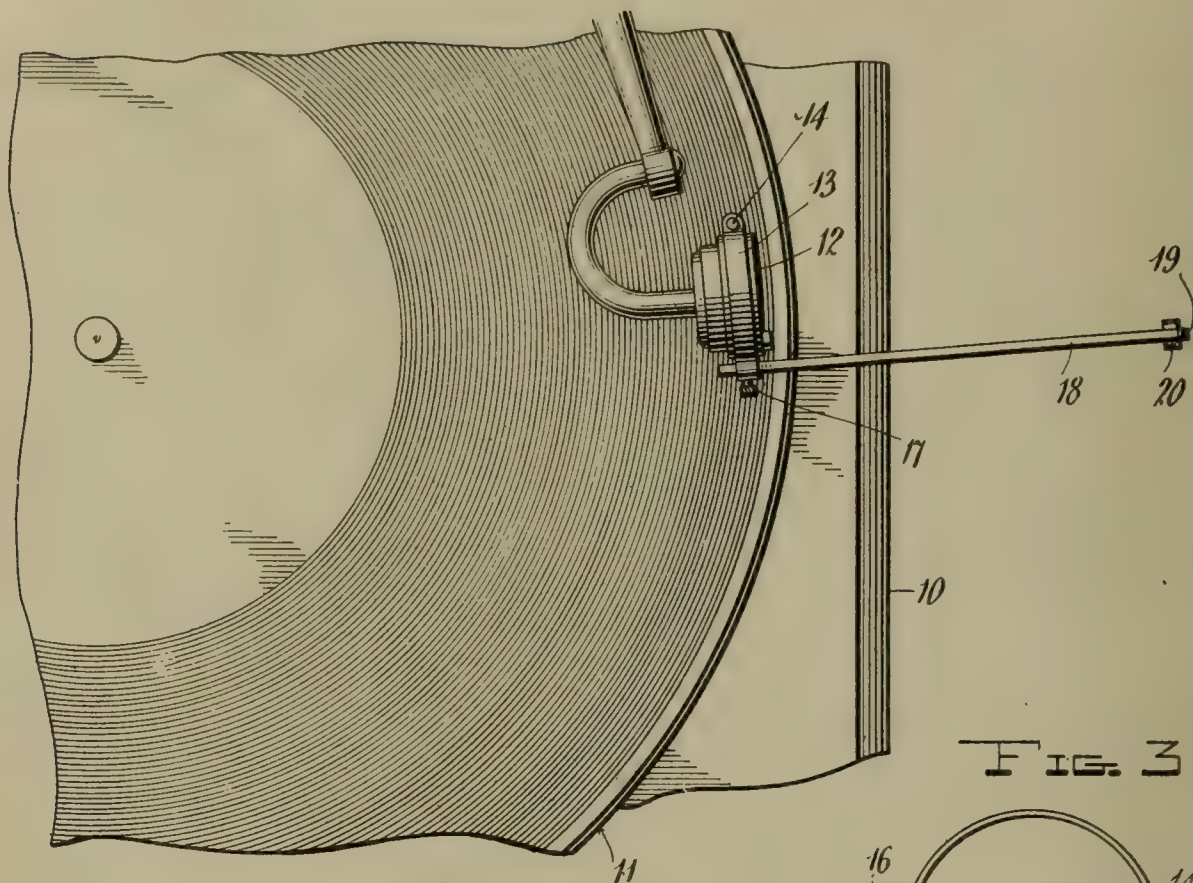


FIG. 3

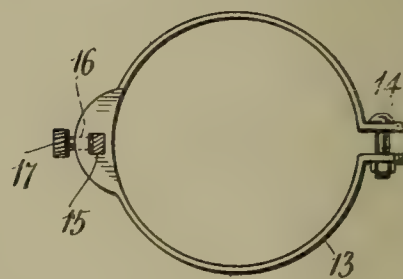
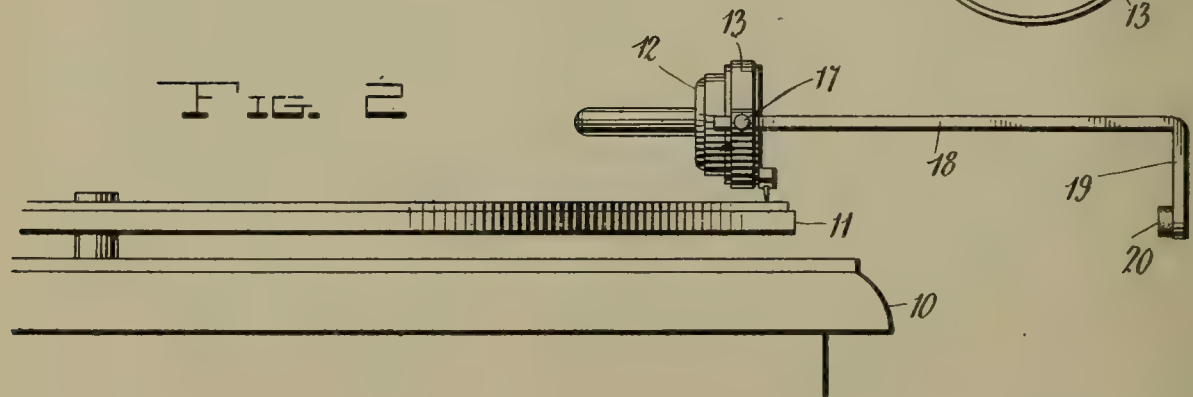


FIG. 2



Inventor

William S. McNamara

Witnesses

J. P. Barton
A. N. Willis

By

Charles Chandler

Attorneys

THE HISTORY OF THE
CITY OF BOSTON
FROM 1630 TO 1800

By JOHN R. HARRIS

Vol. I.

THE CITY OF BOSTON, FROM 1630 TO 1800.

THE CITY OF BOSTON, FROM 1630 TO 1800.

THE CITY OF BOSTON, FROM 1630 TO 1800.

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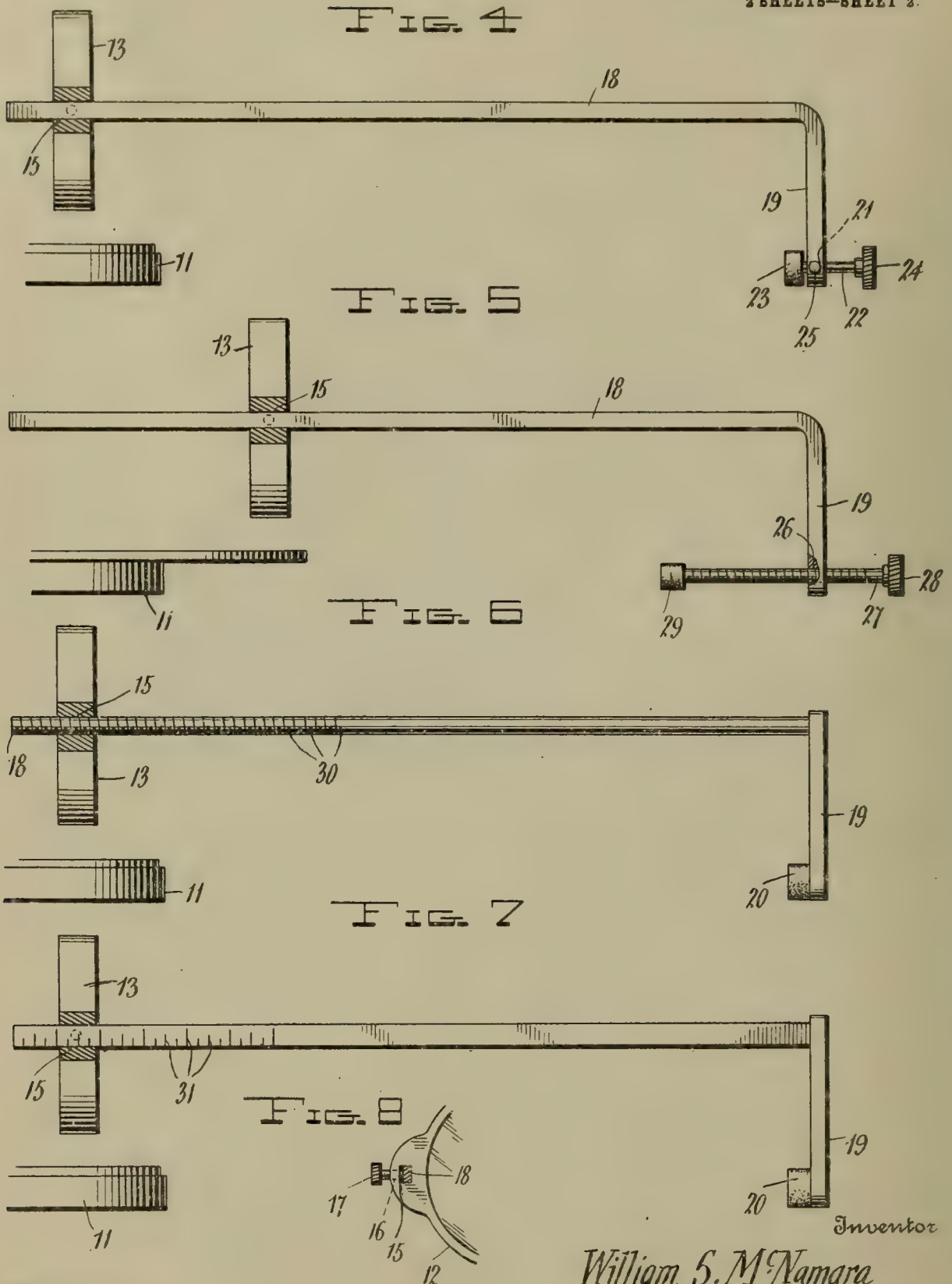
THE CITY OF BOSTON, FROM 1630 TO 1800.

W. S. McNAMARA.
ATTACHMENT FOR TALKING MACHINES.
APPLICATION FILED OCT. 6, 1909.

954,455.

Patented Apr. 12, 1910.

2 SHEETS—SHEET 2.



Witnesses

J. H. Atkins
A. N. Gillis

Inventor

William S. McNamara

Charles C. Chandler

Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM S. McNAMARA, OF SAN FRANCISCO, CALIFORNIA.

ATTACHMENT FOR TALKING-MACHINES.

954,455.

Specification of Letters Patent.

Patented Apr. 12, 1910.

Application filed October 6, 1909. Serial No. 521,219.

To all whom it may concern:

Be it known that I, WILLIAM S. McNAMARA, a resident of the United States, residing at San Francisco, in the county of San Francisco, State of California, have invented certain new and useful Improvements in Attachments for Talking-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to sound reproducing machines of the disk type and has special reference to a mechanism adapted to be applied to such machines for the purpose of stopping the machine after the reproducing needle has covered a definite part of the record.

One object of the invention is to provide a mechanism whereby a machine of the class described may be stopped when the record is finished.

Another object of the invention is to provide a device of this character which is adapted to be attached to any existing machine without change in the structure thereof.

With the above and other objects in view the invention consists in general of an attachment for sound reproducing machines of the disk type arranged to stop the motion of the disk at a predetermined point.

The invention further consists in certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings, and specifically set forth in the claims.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and Figure 1 is a top plan view of a portion of a disk sound reproducing machine equipped with this invention. Fig. 2 is a partial side elevation of such a machine. Fig. 3 shows the collar or clip adapted for application to the sound box of a talking machine. Fig. 4 shows a view of a modified form of brake end. Fig. 5 is a second modification of the brake end such as is used for machines employing disks or records larger than the revolving plate. Fig. 6 is a modified form of the brake arm or standard. Fig. 7 is another modification thereof. Fig. 8 is a modification showing a lug cast on the sound box of a talking machine for the attachment of the stop.

The numeral 10 indicates the box or casing of the machine and this machine is equipped with the usual revolving plate 11.

At 12 is indicated the sound box and this sound box is of the ordinary shape and size.

The attachment forming the subject of this patent comprises a collar or clip 13 arranged to fit over the sound box and secured thereto by means of a suitable set screw 14. Through this collar or clip extends an opening 15 which is intersected by threaded openings 16 wherein is held a binding screw or set screw 17. Through the opening 15 extends a brake standard 18 which has a downwardly bent outer end as indicated at 19. In the form ordinarily adopted this brake standard is provided at 20 with a suitable facing of rubber, leather or the like to constitute the brake. This form may be modified by constructing the downwardly bent end with an opening therethrough as indicated at 21, and when so modified, through this opening extends a rod 22 having on its inner end the brake member as indicated at 23 and on its outer end a suitable grip 24. This rod is held in position by means of a set screw 25 secured in a threaded opening which intersects the opening 21.

In the modification shown in Fig. 5 the opening 21 is replaced by a threaded opening 26 wherein is held a threaded brake screw 27 having a knurled head 28 and carrying a brake member 29.

In the modification of the standard shown in Fig. 6 this standard is threaded as indicated at 30 while in the modification shown in Fig. 7 the standard has suitable scale marks 31 thereon. In the case of the form shown in Fig. 6 the opening 15 is threaded to permit the screwing of the standard in said opening so that the distance of the downwardly bent end 19 may be adjusted by said screw while in the other forms disclosed this distance is regulated by sliding the standard through the opening and adjusting the set screw 17 to hold it in position.

In the operation of any of these devices the standard 18 is set so that the needle rests in the last grooves of the record when the brake face bears against the rim of the revolving plate. When this is done the machine is started in the usual manner and the needle feeds across the record in the ordinary way. When the record has been played the needle runs into the idle grooves which occur at the end of every record and while

in these grooves carries the standard to such position that the brake piece or member bears against the rim of the revolving plate thus stopping the machine.

5 By means of this construction the machine may be started and left to run by itself without fear of running the spring down or using up the battery if such be used to operate the device. Furthermore, the wear of
10 the needle is prevented as the record is checked at the end of each piece. There has thus been provided a simple and efficient device of the kind described and for the purpose specified.

15 It is obvious that minor changes may be made in the form and construction of this invention without departing from the material principles thereof. It is not therefore desired to confine the invention to the exact
20 form herein shown and described, but it is wished to include all such as properly come within the scope of the appended claims.

Having thus described the invention, what is claimed as new, is:—

25 1. In an attachment for talking machines,

a clip adapted for engagement on a needle carrying element, said clip having a standard receiving opening extending there-through, a standard held in said opening to move longitudinally thereof, means to hold
30 said standard in adjusted position in said opening, and a brake member supported by said standard.

2. In an attachment for talking machines, a clip adapted for engagement on a needle
35 carrying element, said clip having a standard receiving opening extending there-through, a standard held in said opening to move longitudinally thereof, means to hold
40 said standard in adjusted position in said opening, a brake member supported by said standard, and other means to hold said brake member in adjusted position relative to said standard.

In testimony whereof, I affix my signature, in presence of two witnesses.

WILLIAM S. McNAMARA.

Witnesses:

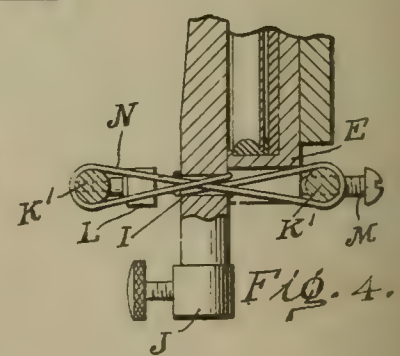
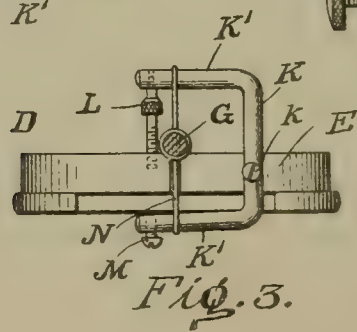
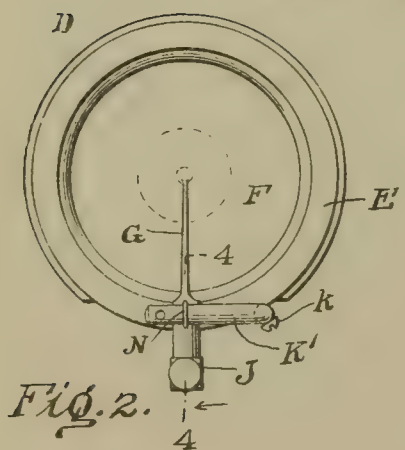
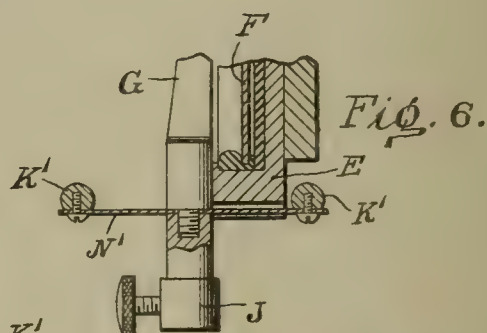
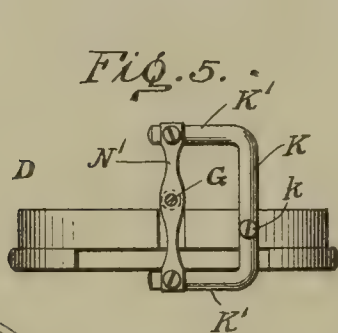
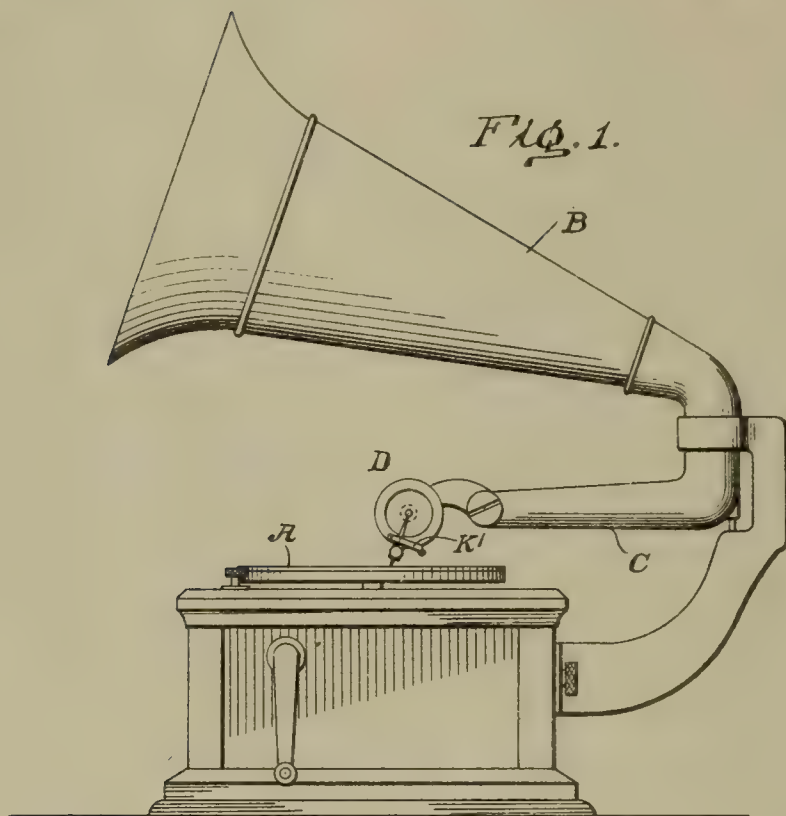
M. COOK,

E. C. McMILLAN.

R. L. GIBSON.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED OCT. 27, 1906.

954,953.

Patented Apr. 12, 1910.



WITNESSES:
D. Webster, Jr.
R. M. Kelly.

INVENTOR
Robert L. Gibson

By 
Attorney

UNITED STATES PATENT OFFICE.

ROBERT L. GIBSON, OF PHILADELPHIA, PENNSYLVANIA.

SOUND-BOX FOR TALKING-MACHINES.

954,953.

Specification of Letters Patent.

Patented Apr. 12, 1910.

Application filed October 27, 1905. Serial No. 284,646.

To all whom it may concern:

Be it known that I, ROBERT L. GIBSON, of the city and county of Philadelphia and State of Pennsylvania, have invented an
5 Improvement in Sound-Boxes for Talking-Machines, of which the following is a specification.

My invention has reference to sound boxes for talking machines and consists of certain
10 improvements which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

The object of my invention is to provide
15 a construction of sound box for talking machines, which shall have great sensitiveness whereby the volume of sound may be increased without loss of timbre or accuracy of articulation.

My invention consists in supporting the
20 stylus bar on a pivotal connection formed by a spring whose length is in a plane at right angles to the plane of the diaphragm.

My invention further consists in provid-
25 ing the sound box with a stylus bar secured to or in contact with the diaphragm and suspended from the frame of the sound box by a wire structure under tension.

My invention also consists in providing
30 an expansible frame to which the wire structure is secured, combined with adjusting devices for the expansible frame whereby the wire structure may have its tension ad-justed.

My invention also embodies details of con-
35 struction which, together with the features above specified, will be better understood by reference to the drawings, in which:

Figure 1 is an elevation of a talking machine embodying my invention; Fig. 2 is a
40 front elevation of the sound box; Fig. 3 is a bottom view of the sound box; Fig. 4 is an enlarged sectional view on line 4-4 of Fig. 2 showing my improved manner of suspend-
45 ing the stylus bar; Fig. 5 is a bottom view of a sound box showing a modification of my invention; and Fig. 6 is a sectional elevation of the same.

Referring to Fig. 1, A is the rotating
50 record carrying disk or table, B is the horn, C is the swinging sound conveying arm and D is the sound box suspended from the arm and may be connected with it in any suitable manner.

55 The sound box consists of the following construction. The box frame or head E

contains the diaphragm F which is arranged therein in any way. G is the stylus bar and is secured at one end to the center of the diaphragm F and provided at the other or
60 free end with a clamp J of any convenient construction for holding the stylus or needle point. At a short distance from the clamp J, the stylus bar is provided with a hole I through which the suspension wire N is
65 passed. This suspension wire is looped about the two arms of an expansible frame K which is preferably U-shaped and secured to the box or head E at $\frac{1}{2}$ whereby its two arms K' are adapted for adjustment. The
70 wire N is preferably of one continuous length, starting from the stylus bar and terminating thereon. The ends and central part of this wire are passed through a hole I in the stylus bar G; and said ends are
75 twisted about each other or the body of the wire and preferably soldered to the stylus bar to securely hold them. It is best that the two portions of the wire extending between the arms K' K' shall cross whereby they
80 pass through the hole in the stylus bar. The arms K' are adjusted to or from each other by the screws L and M, which are screwed into the arms and rest against the body of the sound box case or head E. By
85 means of these screws the two arms may be adjusted to or from each other and relatively to the sound box head E, the latter adjustment securing the proper positioning of the stylus bar G and the former the
90 tension of the looped wire. The screw $\frac{1}{2}$ may hold the expansible frame K rigidly to the head E or permit a small oscillation as preferred, the position and adjustment of the arms K' of said frame being secured by
95 the screws L M. It is also evident that if the frame K is rigidly held by the head E, one of the screws L M might be dispensed with and hence I do not limit myself to the use of the two screws.

While I have shown the expansible frame as formed in U-shape, I do not in any wise restrict myself thereto, as this frame may be formed in any suitable manner so long as it sustains the wire loops and permits them to
105 be held under proper tension. Furthermore, while I have shown the screws L, M for adjusting the expansible frame, any other suitable means for securing the adjustment may be used in lieu thereof. Neither do I con-
110 fine myself to the particular arrangement of the wire for supporting the stylus bar, as my

invention comprehends broadly the support of the stylus bar by a wire connection which holds it in proper relation to the head and diaphragm.

5 While it is not new to connect the bar to a spring supported at its ends and arranged transversely to the plane of the diaphragm, in former constructions of this kind the spring is not the sole means of supporting
10 and sustaining the stylus bar, but is the means of holding the stylus bar on a fulcrum between a portion of the stylus bar and the head upon which the bar vibrates. In my construction the spring acts not as a
15 means of holding the bar upon a stationary fulcrum but as the sole means of supporting the bar and the usual stationary fulcrum is dispensed with. The bar vibrates at the point of connection with the spring and not
20 on a stationary or fixed fulcrum.

The advantage secured by my improved method of pivoting the stylus bar is that the stylus bar is exceedingly sensitive of oscillation and practically the entire effect produced upon the stylus by the record groove is transmitted to the diaphragm, and therefore the articulation is particularly loud and clear. Furthermore, the construction is inexpensive and is easy of adjustment.

30 In the modified form of my invention shown in Figs. 5 and 6, I employ a steel plate spring N' instead of the wire. The stylus bar G extends through the spring at its middle and the ends of the spring are secured to the U-shaped frame K by rivets or
35 screws. To make the spring very sensitive, it may be reduced in width upon each side of the stylus bar. In this construction as in that first described the spring is in the
40 plane of vibration of the stylus bar, namely a plane at right angles to the plane of the diaphragm, and the length of the spring is also substantially at right angles to the diaphragm.

45 While I prefer that the frame K shall be expansible, it is not necessarily so, and especially is this true of the modification shown in Figs 5 and 6.

Therefore while I prefer the construction shown as being excellently adapted to the purpose of my invention, I do not restrict myself to the details as these may be modified in various ways without departing from the spirit of the invention.

55 Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a sound-box for talking machines, the combination of the case and diaphragm,
60 a stretched wire for carrying the stylus bar supported at its opposite ends only by points of support which with the wire are disposed in a line transversely to the plane of the diaphragm and which wire by the oscillations
65 of the stylus bar is caused to continually

vary its tension in the direction of its length, and a stylus bar connected with the wire between the ends thereof, said wire having the function of a fulcrum and yieldingly supporting the stylus bar so that it may rock in
70 the direction of the length of the wire and vary its tension.

2. In a sound-box for talking machines, the combination of the case and diaphragm, a stretched wire for carrying the stylus bar
75 supported at its opposite ends only by points of support which with the wire are disposed in a line transversely to the plane of the diaphragm and which wire by the oscillations of the stylus bar is caused to continually
80 vary its tension in the direction of its length, a stylus bar connected with the wire between the ends thereof, said wire having the function of a fulcrum and yieldingly supporting the stylus bar so that it may rock in the direction
85 of the length of the wire and vary its tension, and means to the points of support to or from each other in a line transversely to the plane of the diaphragm to vary the normal tension of the said stretched wire. 90

3. In a sound-box for talking machines, the combination of the case and diaphragm, a stretched spring for carrying the stylus bar supported rigidly at its opposite ends only by points of support which with the
95 spring are disposed in a line transversely to the plane of the diaphragm and which spring by the oscillations of the stylus bar is caused to continually vary its tension in the direction of its length, and a stylus bar
100 connected with the spring between the ends thereof, said spring having the function of a fulcrum and yieldingly supporting the stylus bar so that it may rock in the direction of the length of the spring and vary its
105 tension.

4. In a sound box for talking machines, the combination of the head or case and diaphragm, a stylus bar acting upon the diaphragm, an expansible frame secured to
110 the head or case and a looped wire structure having its loops connected to portions of the expansible frame on each side of the stylus bar and supporting the stylus bar intermediate of said loops whereby it is
115 free to oscillate in a plane transversely to the length of the loops.

5. In a sound box for talking machines, the combination of the head or case and diaphragm, with a stylus bar acting upon
120 the diaphragm, an expansible frame secured to the head or case and a looped wire structure having its loops connected to portions of the expansible frame on each side of the stylus bar and supporting the stylus bar
125 intermediate of said loops whereby it is free to oscillate in a plane transversely to the length of the loops, and means for adjusting the expansible frame to put the wire loop portions under greater or less tension. 130

6. In a sound box for talking machines,
the combination of the head or case and
diaphragm, with a stylus bar acting upon
the diaphragm, an expansible frame secured
5 to the head or case and a looped wire struc-
ture having its loops connected to portions
of the expansible frame on each side of the
stylus bar and supporting the stylus bar
intermediate of said loops whereby it is free
10 to oscillate in a plane transversely to the
length of the loops, and means for adjusting
the expansible frame relatively to the head
or case whereby the stylus bar may be
adjusted relatively to the diaphragm and
15 head.

7. In a sound-box for talking machines,
the combination of the head or case and
diaphragm, a U-frame carried by said head,
a spring between the arms of said U-frame,
20 said supprting arms of the U-frame and
the spring being disposed transversely to the

plane of the diaphragm, and a stylus bar
connected with said spring between the ends
thereof and being wholly sustained and sup-
ported by said spring and diaphragm. 25

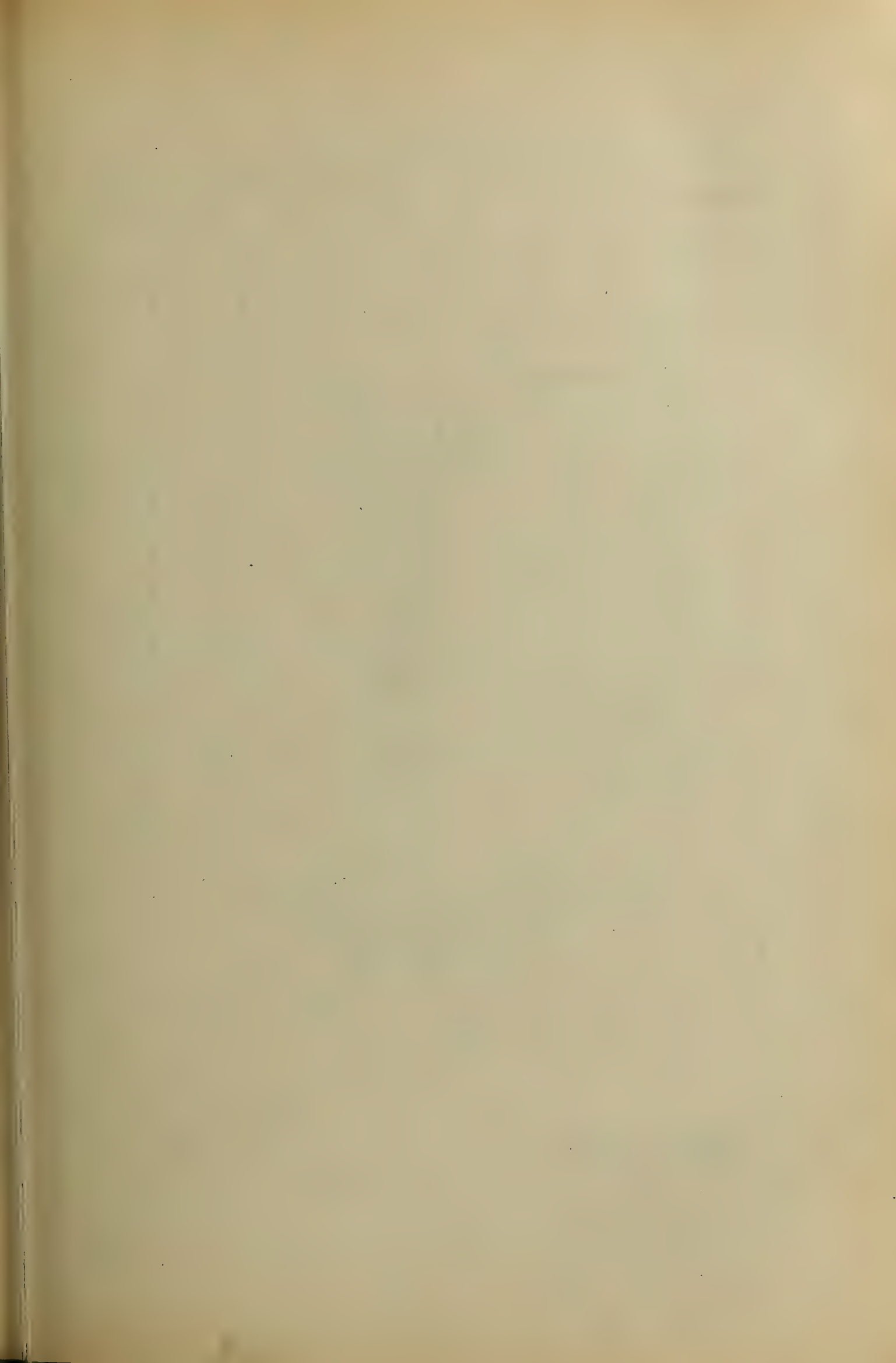
8. In a sound-box for talking machines,
the combination of the head or case and
diaphragm, a frame carried by said head, a
wire looped about the ends of said frame
and forming a supporting spring extending 30
transversely to the plane of the diaphragm,
and the stylus bar acting on the diaphragm
and connected with said looped wire between
the points of support thereof and being
wholly sustained and supported by said wire 35
and the diaphragm.

In testimony of which invention, I here-
unto set my hand.

ROBERT L. GIBSON.

Witnesses:

ERNEST HOWARD HUNTER,
R. M. KELLY.



H. T. OLIVER.
 PHONOGRAPH.
 APPLICATION FILED SEPT. 15, 1908.

955,424.

Patented Apr. 19, 1910.

2 SHEETS—SHEET 1.

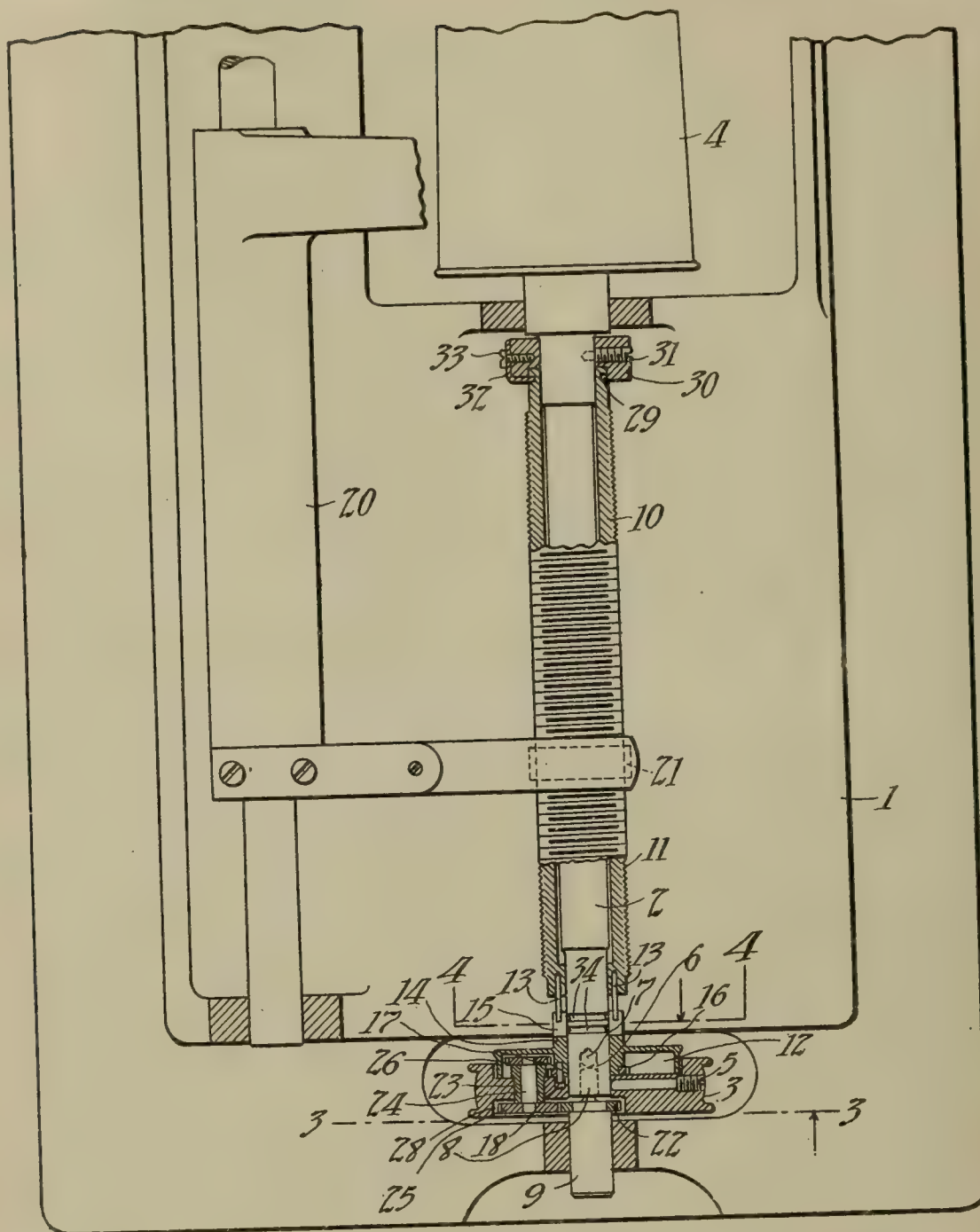
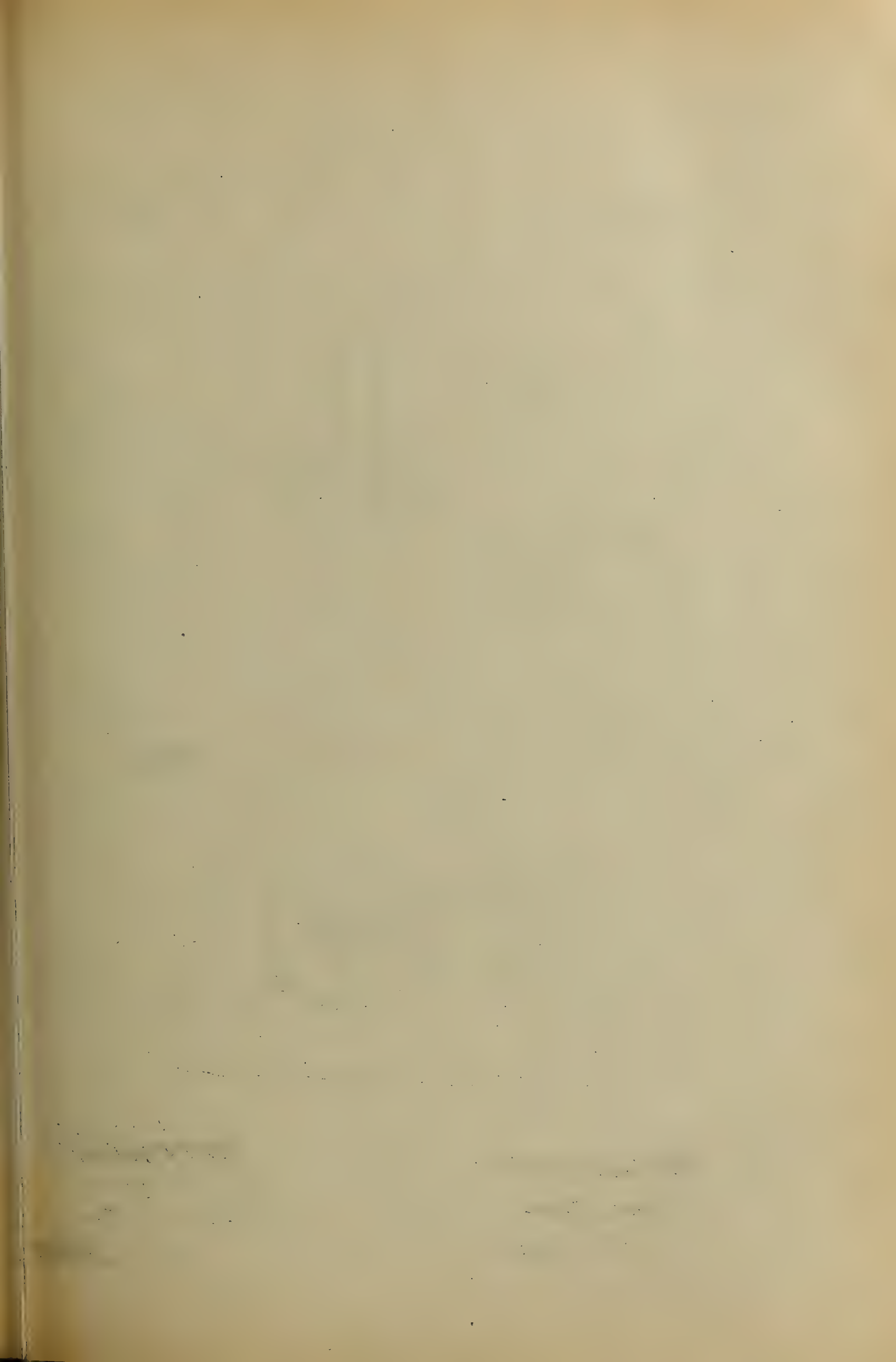


Fig. 1

Witnesses:
 Frank D Lewis
 H H Dyke

Inventor:
 Henry P. Oliver
 by Frank L. Brown
 Atty.



H. T. OLIVER.

PHONOGRAPH.

APPLICATION FILED SEPT. 15, 1908.

955,424.

Patented Apr. 19, 1910.

2 SHEETS—SHEET 2.

Fig. 7

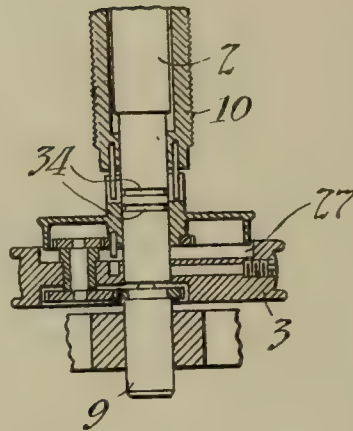


Fig. 4

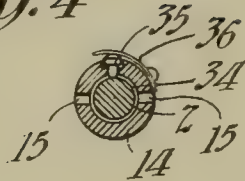
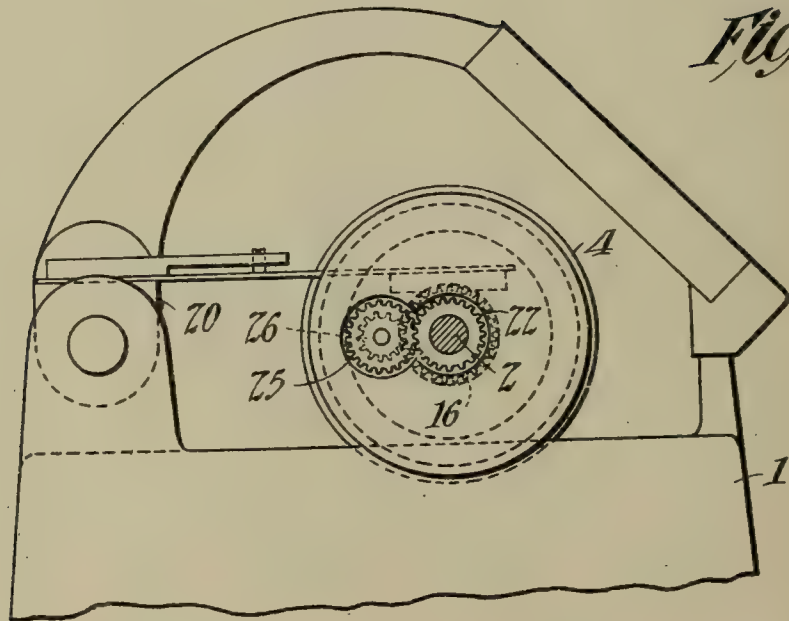


Fig. 3



Witnesses:
Frank S. Lewis
H. H. Dyke

Inventor:
Hewitt P. Oliver
By Frank L. Dyke
Atty.

UNITED STATES PATENT OFFICE.

HENRY T. OLIVER, OF NEWARK, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH.

955,424.

Specification of Letters Patent.

Patented Apr. 19, 1910.

Application filed September 15, 1908. Serial No. 453,119.

To all whom it may concern:

Be it known that I, HENRY T. OLIVER, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographs, of which the following is a description.

My invention relates to phonographs and has for its object the provision of interchangeable means for feeding the traveling carriage upon which the sound box is mounted at either of two rates of speed, one of which may be suitable for operating upon a record having one hundred threads per inch and the other for operating upon a record having two hundred threads per inch. The particular means employed by me in a general way embodies the invention disclosed in the application of Peter Weber, Serial No. 425,844, filed April 8th, 1908, in that there is a hollow rotary feed screw mounted concentrically with respect to an inner shaft and capable of being locked to said shaft so as to rotate therewith, or of being unlocked therefrom and driven thereby through interposed gearing so as to rotate at a different rate of speed.

My invention relates more particularly to improvements in the mounting of the hollow shaft, the means for locking the same to the inner shaft and for gearing the two shafts together, with a view to obtaining a structure in which the movable parts are protected to a great extent, are few in number, and capable of operating at the desired high rate of speed without undue wear or noise, such as would be objectionable in a phonograph, and in which the arrangement of the parts is compact and capable of being applied to phonographs of ordinary construction without any changes in the frame or stationary parts of such machines, and without the provision of any supplementary or auxiliary frame for attachment to the phonograph body.

With these ends in view, my invention consists in the features hereinafter described and claimed.

In order that my invention may be more fully understood, reference is hereby made to the accompanying drawing, forming part of this specification, and in which—

Figure 1 is a plan view, partly in section, of a phonograph constructed in accordance with my invention, the parts being arranged

for feeding the sound box carriage at a suitable speed for operating upon records having one hundred threads per inch; Fig. 2 is a view of a portion of Fig. 1 except that the parts occupy the positions which are assumed when the carriage is to be fed at a speed suitable for operating upon records having two hundred threads per inch; Fig. 3 is a section on line 3—3 of Fig. 1, and Fig. 4 is a section on line 4—4 of Fig. 1. In all the views corresponding parts are designated by the same numerals of reference.

The phonograph shown is of a well known type and comprises a base or body 1 upon which is rotatably mounted the main shaft 2, which carries at one end a driving pulley 3, and at the opposite end the mandrel 4, for supporting the sound record. This shaft may be supported in any suitable manner. As shown, the end upon which the pulley is mounted is cupped at 6, to receive a spherical roller or ball 7, and a stud or center 8 is formed on the pin 9 which is secured to the body 1. Upon the shaft 2 is rotatably mounted a hollow shaft 10 formed with a feed screw 11 of fine pitch, preferably one hundred threads to the inch, said screw shaft being journaled at its ends upon the shaft 2 as shown. The outer end of the screw shaft 10 is provided with a pair of oppositely disposed pins 13 and upon the shaft 2 is slidably mounted a sleeve 14 formed with a cup 12 integral therewith. One end of said sleeve is formed with a pair of notches 15 which receive the pins 13 of the shaft 10, thereby causing said members to rotate together. On the other end of said sleeve is fixed a spur gear 16 and one or more pins 17 projecting from its face and adapted to engage holes or sockets 18 formed in the web of the pulley 3 which is fixed to the shaft 2 by means of a set screw 5. When in this position, as illustrated in Fig. 1, the sleeve 14 and shaft 2 are locked together and the screw shaft 10 is therefore locked to the shaft 2 and rotates at the same speed, and by reason of the engagement of the feed nut 21 with the screw 11, feeds the sound box carriage 20 at a rate suitable for operating upon records having one hundred threads per inch.

There is a spur gear 22 which is fixed upon a shouldered portion of the pin 9, and there is a bearing 23 carried by the pulley

3, in which is journaled a shaft 24, upon the ends of which are secured the spur gears 25 and 26. The gear 25 meshes with the gear 22 and the gear 26 is so placed that when the parts occupy the position shown in Fig. 1, it is out of engagement with the gear 16, and the shaft 24 rotates idly. When the parts are in the position shown in Fig. 2, the gears 16 and 26 are in driving engagement and the pin 17 entirely withdrawn from the socket 18, so that the shaft 10 is unlocked from the shaft 2, and is driven from the pulley 3 by reason of the engagement of the gear 25 with the fixed gear 22 and the gear 26 with the gear 16, which gears are so proportioned as to drive the shaft 10 at half the speed of the shaft 2 and thereby feed the carriage 20 at a rate suitable for operating upon records having two hundred threads per inch. In order, therefore, to render the instrument capable of operating upon records having one hundred threads per inch, it is necessary only to move the sleeve 14 into such position as to lock the same to the pulley 3 by the engagement of the pin 17 with the socket 18, as shown in Fig. 1, and in order to adapt the instrument to operate upon records having two hundred threads per inch, it is necessary only to move the sleeve 14 from the position of Fig. 1 into that of Fig. 2.

It will be observed that the cup 12 which is formed upon the sleeve 14 fits closely within the circular opening 27 in the face of the pulley 3 and incloses and protects the gears 26 and 16, and that the opposite face of the said pulley is provided with a recess 28 in which are situated the gears 22 and 25. Thus the entire interchangeable gear system occupies about the same space as the drive pulley of the main shaft of the ordinary phonograph, and the driving parts or gears are largely protected from dust and dirt, while at the same time the practical operation of my invention has shown me that there is very little noise produced by the driving mechanism when operating in either of its positions, so that it does not detract at all from the operation of the instrument. Furthermore, my improvements may be readily applied to an ordinary phonograph, as it is necessary only to remove from the phonograph the shaft which carries the mandrel, feed screw and driving pulley, and substitute therefor the concentric shafts 2 and 10, pulley 3 and parts associated therewith.

In order to prevent longitudinal movement of the shaft 10 a groove 29 is formed in the end thereof, and there is a collar 30 secured by a set screw 31 to the shaft 2. A bent plate 32 is secured to said collar by a screw 33, in such a way that its end engages said groove 29, as shown in Fig. 1.

In order to lock the sleeve 14 in either of its operative positions, a pair of grooves 34

are formed in the shaft 2, and there is a small pin 35 (see Fig. 4) mounted in an opening in the sleeve 14, in such position as to enter one of the grooves 34 when the sleeve is in the position of Fig. 1, and the other of said grooves when said sleeve is in the position of Fig. 2. The inner end of the pin 35 is rounded, and there is a flat spring 36 secured at one end to the sleeve 14 by a screw 37, the free end of said spring pressing upon the head of the pin 35, whereby said pin operates as a detent releasable by the longitudinal movement of the sleeve 14, which will ordinarily be operated by the hand, although special means may be provided for this purpose, if desired.

Having now described my invention, what I claim is:

1. In a phonograph, the combination of the main shaft, a rotary hollow feed screw shaft surrounding said main shaft, a gear concentric and rotatable with said hollow shaft, a fixed gear concentric therewith, and a planet wheel for driving said rotary gear from said fixed gear, substantially as set forth.

2. In a phonograph, the combination with the rotating hollow feed screw shaft, of a rotary shaft within said screw shaft, means for locking said shafts together so as to rotate at the same speed, and means interchangeable therewith for gearing said shafts together so as to rotate at different speeds and comprising a fixed and a rotary gear concentric with said shafts, and a planet wheel, substantially as set forth.

3. In a phonograph, the combination of the main shaft, a rotary hollow feed screw shaft surrounding said main shaft, a drive pulley fixed to said main shaft and planetary gearing applied to said pulley and adapted to drive the hollow shaft in the same direction as the main shaft but at a different speed, substantially as set forth.

4. In a phonograph, the combination of the main shaft, a rotary hollow feed screw shaft surrounding said main shaft, a drive pulley fixed to said main shaft, and planetary gearing adapted to drive the hollow shaft in the same direction as the main shaft but at a different speed, said pulley being recessed to receive said gearing, substantially as set forth.

5. In a phonograph, the combination of the main shaft and hollow feed screw shaft concentric therewith, a longitudinally movable sleeve 14 rotatable with the hollow shaft 10, said sleeve being formed with a cup, and a planet wheel adapted to connect said shafts in driving relation and so situated as to be protected by said cup, substantially as set forth.

6. In a phonograph, the combination of a hollow feed screw shaft and main shaft concentric therewith, a drive pulley secured

to the main shaft and formed with a recess,
a sleeve rotatable with said hollow shaft
and movable longitudinally thereof, said
sleeve being so situated as to close said re-
cess formed in said pulley, substantially as
set forth.

7. In a phonograph, the combination of
the hollow feed screw shaft and main shaft
concentric therewith, a drive pulley secured
to the main shaft and formed with a recess,
a fixed gear concentric with said pulley and
situated within said recess, and a planet
wheel carried by said pulley in driving re-
lation to said fixed gear, substantially as set
forth.

8. In a phonograph, the combination of
the hollow feed screw shaft and main shaft

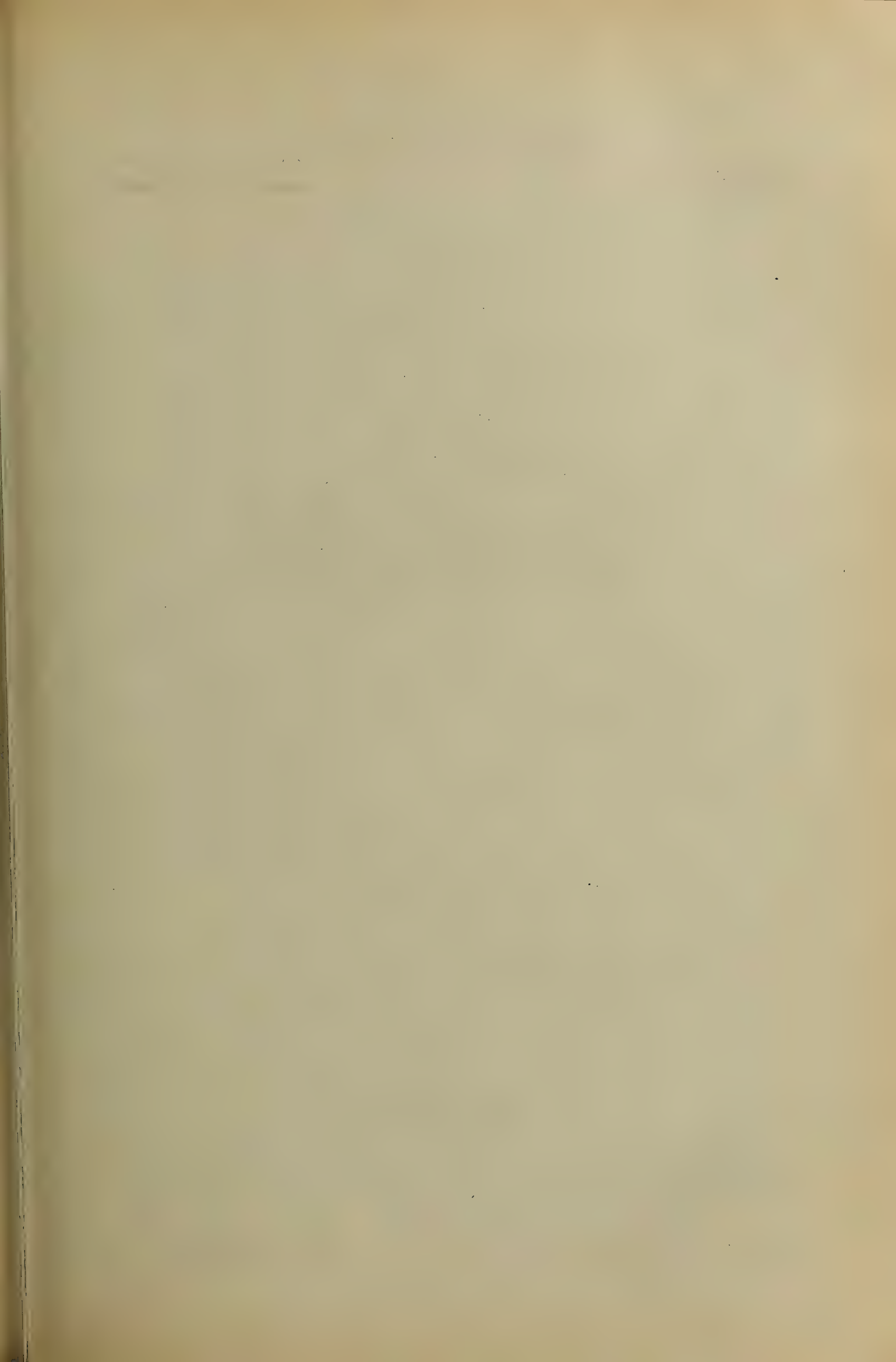
concentric therewith, a sleeve rotatable with
said screw shaft but slidable into different
positions axially with respect thereto, gear
means, means for coupling said shafts to-
gether directly through said sleeve in one
position thereof and through said gear
means in another position thereof, and
means for locking said sleeve in each of its
operative positions, substantially as set
forth.

This specification signed and witnessed
this 31st day of August 1908.

HENRY T. OLIVER.

Witnesses:

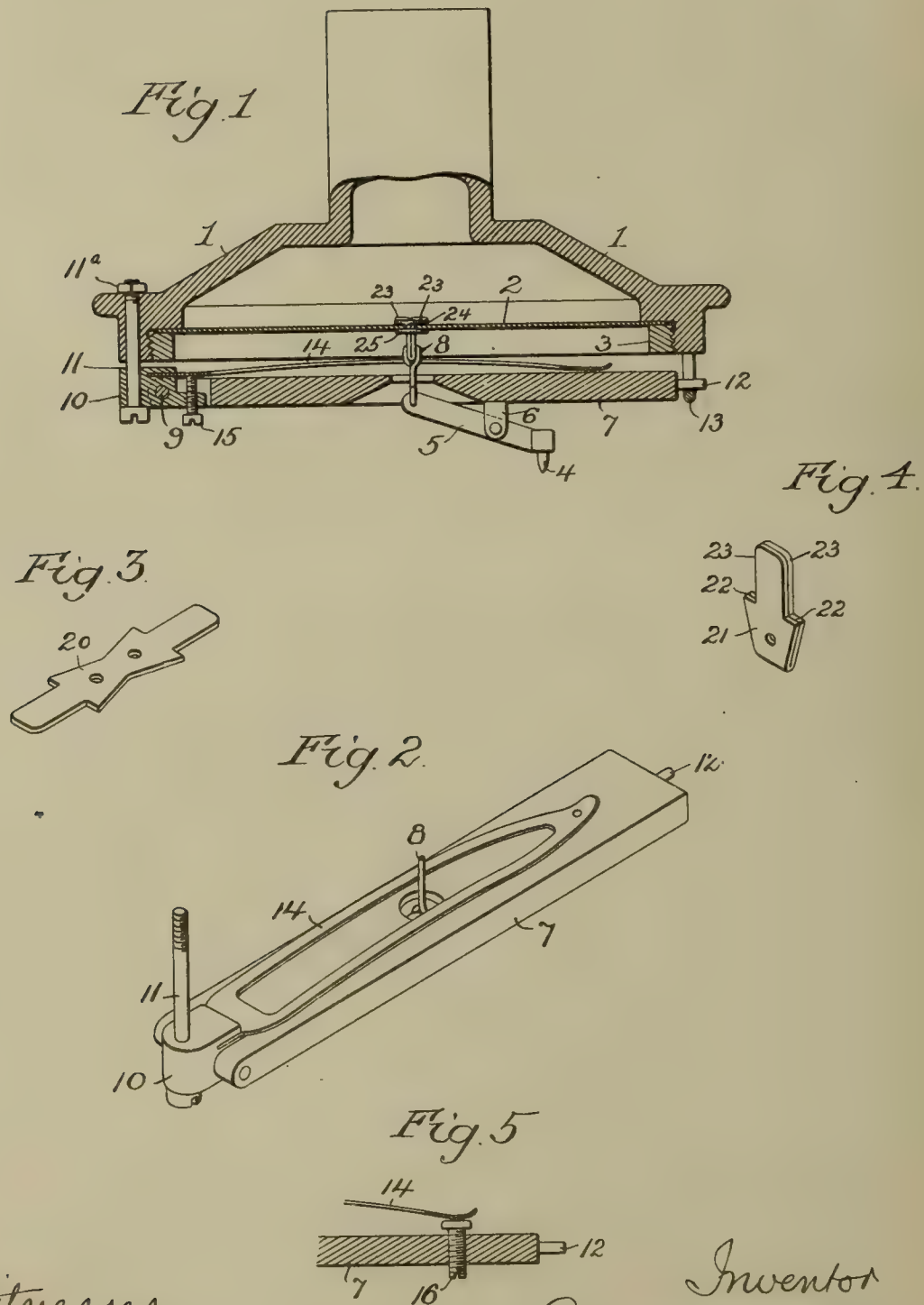
DELOS HOLDEN,
H. H. DYKE.



E. H. MOBLEY.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED AUG. 17, 1907.

955,894.

Patented Apr. 26, 1910.



Witnesses
Hamilton D. Turner
Elsie Fullerton

Inventor
Edwin H. Mobley
by his Attorneys
Smith & Craig

UNITED STATES PATENT OFFICE.

EDWIN H. MOBLEY, OF HILLSIDE, PENNSYLVANIA.

SOUND-BOX FOR TALKING-MACHINES.

955,894.

Specification of Letters Patent.

Patented Apr. 26, 1910.

Application filed August 17, 1907. Serial No. 389,028.

To all whom it may concern:

Be it known that I, EDWIN H. MOBLEY, a citizen of the United States, residing in Hillside, Montgomery county, Pennsylvania, have invented certain Improvements in Sound-Boxes for Talking-Machines, of which the following is a specification.

My invention relates to sound boxes for use in connection with records having grooves of the "hill-and-valley" type, the objects of my invention being to provide for the secure connection of the stylus lever to the diaphragm, and for the proper contact of the stylus with the undulating bottom of the groove without impairing the desired freedom of movement of said stylus and without affecting the purity of the reproduction. These objects I attain in the manner hereinafter set forth, reference being had to the accompanying drawing, in which—

Figure 1 is a view partly in side elevation and partly in vertical longitudinal section of a sound box constructed in accordance with my invention; Fig. 2 is a perspective view showing certain elements of said sound box detached therefrom; Fig. 3 is an enlarged perspective view of the blank from which the diaphragm connection is made; Fig. 4 is a perspective view of the same after it has been bent for application to the diaphragm and connecting link, and Fig. 5 is a sectional view illustrating a modification of one of the features of my invention.

1 represents the cup-like casing of the sound box to which the diaphragm 2 may be secured in any desired way, the means adopted in the present instance for effecting this object being a threaded ring 3 which engages a thread formed on the inner wall of the sound box and serves to confine the outer portion of the diaphragm against a suitable shoulder in said box.

The stylus 4 which engages the groove of the record is carried, as usual, by one arm of a stylus lever 5, pivotally mounted upon a bracket 6 which is secured to a weighted arm 7, the other arm of said lever being connected to the diaphragm 2 by means of a link 8 which passes through a central opening in the arm 7.

The arm 7 is hung by means of a pivot pin 9 to a block 10, which is pivotally mounted upon a pin 11, the latter passing through an opening in the sound box casing,

and having a threaded upper end for the reception of a nut 11^a which bears upon said casing. The pin 11 is disposed at a right angle to the pivot pin 9, whereby swinging movement of the arm 7 in all directions is permitted within the limits imposed by contact of a projecting pin 12 at the outer end of the arm with a yoke 13 projecting from the face of the sound box, as shown in Fig. 1, freedom of lateral movement being insured owing to the fact that the block 10 can swing upon the pin 11, and the latter can turn in the opening to which it is adapted.

It is advisable in many cases to employ in connection with the arm 7 a spring for pressing upon said arm and imparting an outward thrust thereto. Such a spring is illustrated at 14 in the drawing, one end of the spring being secured, by soldering or otherwise, to the pivoted block 10, and its other end bearing upon the inner face of the arm 7, the spring having a central opening or slot for the passage of the link 8. By this means the spring partakes freely of the lateral movements of the arm 7 and therefore opposes no resistance to such movements or to the movements of the stylus 4 and stylus lever 5, consequently the freedom of movement of the stylus is not restricted in any way by the action of the spring, nor is the purity of the reproduction impaired by any scraping contact of the spring with the lever, as it would be if said spring was mounted upon a fixed member of the sound box casing instead of upon the pivoted and swinging block 10. In so far as the attainment of the desired result is concerned, it is, in a measure, immaterial which end of the spring is the one to be secured, although the construction shown is preferred.

If adjustment of the tension of the spring 14 is desirable, this may be effected either by means of an adjustable screw 15 carried by the block 10, and bearing upon the spring in advance of its point of connection to the block, as shown in Fig. 1, or by means of a screw 16 carried by the arm 7 and constituting the bearing point for the free end of the spring, as shown in Fig. 5.

The link 8 is usually cemented to the diaphragm 2 but this is an unstable and otherwise objectionable means of attachment, in place of which I use a clip consisting of a strip 20 of sheet metal as shown in Fig. 3,

this strip being first bent, as shown in Fig. 4, so as to form a loop 21 with shoulders 22 at the base and projecting wings 23, which after being passed through a central opening in the diaphragm are bent down upon the back of the same, a washer 24 being, by preference, interposed between the diaphragm and the bent wings, and another washer 25 being interposed between the diaphragm and the shoulders 22 at the base of the loop 21, the latter projecting from the face of the diaphragm and being perforated for the reception of the link 8, or otherwise constructed for close fitting connection with said link or with such other connection as may be interposed between the diaphragm and the stylus lever. The clip thus rigidly and securely confined to the central portion of the diaphragm, provides a stable connection which is not impaired by long continued use of the sound box or by changes of temperature or rough handling to which the sound box may be subjected.

I claim:—

1. The combination, in a sound box for talking machines, of the sound box casing and its diaphragm, a stylus lever connected to the diaphragm, an arm to which said stylus lever is pivoted, a member to which said arm is pivoted, said member having pivotal connection with the casing the axis of which connection is at right angles to the pivot of the arm, and a spring coöperating with the arm and with said pivot member, said spring being secured at one end to one of said parts and imparting outward thrust to the pivoted arm.

2. The combination, in a sound box for talking machines, of the sound box casing and its diaphragm, a stylus lever connected to the diaphragm, an arm to which said stylus lever is pivoted, a member to which said arm is pivoted, said member having pivotal connection with the casing the axis of which connection is at right angles to the pivot of the arm; and a spring connected to said pivot member and bearing upon the back of the arm so as to impart outward thrust to the latter.

3. The combination, in a sound box for talking machines, of the sound box casing and its diaphragm, a stylus lever connected to the diaphragm, an arm to which said stylus lever is pivoted, a block to which said arm is pivoted, a pin upon which said block is pivotally mounted, said pin being disposed at right angles to the pivot pin of the arm and being pivotally mounted in the casing, and a spring coöperating with the arm and with the pivot block, said spring being secured to one of said parts and serving to impart outward thrust to the arm.

4. The combination, in a sound box for talking machines, of the sound box casing and its diaphragm, a stylus lever connected

to the diaphragm, an arm to which said stylus lever is pivoted, a block to which said arm is pivoted, a pin upon which said block is pivotally mounted, said pin being disposed at right angles to the pivot pin of the arm and being pivotally mounted in the casing, and a spring secured to said pivot block and bearing upon the back of the arm so as to impart outward thrust thereto.

5. The combination, in a sound box for talking machines, of the casing and its diaphragm, a pin pivotally mounted in said casing and having a block pivotally mounted thereon, an arm pivoted to said block, and a stylus lever pivotally mounted on said arm and acting upon the diaphragm.

6. The combination, in a sound box for talking machines, of the sound box casing and its diaphragm, a pivoted and swinging block on said casing, an arm pivoted to said block and carrying a stylus lever which acts upon the diaphragm, a spring coöperating with said arm and block and secured to one of said parts, and means for varying the tension of said spring.

7. The combination, in a sound box for talking machines, of the sound box casing and its diaphragm, a pivoted and swinging block on said casing, an arm pivoted to said block and carrying a stylus lever which acts upon the diaphragm, a spring coöperating with said arm and block and secured to one of said parts, and means carried by the swinging block for varying the tension of said spring.

8. The combination, in a sound box for talking machines, of the sound box casing and its diaphragm, a pivoted and swinging block mounted upon said casing, an arm pivotally mounted upon said block and carrying a stylus lever which acts upon the diaphragm, a spring secured at one end to said block and bearing at the other end upon the arm, and means for varying the tension of said spring.

9. The combination, in a sound box for talking machines, of the sound box casing and its diaphragm, a pivoted and swinging block mounted upon said casing, an arm pivotally mounted upon said block and carrying a stylus lever which acts upon the diaphragm, a spring secured at one end to said block and bearing at the other end upon the arm, and means carried by the swinging block for varying the tension of said spring.

10. The combination, in a sound box for talking machines, of the sound box casing and its perforated diaphragm, a clip passing through said diaphragm and having, on the outer face thereof, a member with shoulders providing a bearing therefor, and projecting wings bent down on the inner face of the diaphragm, a washer interposed between the diaphragm and said wings, another washer interposed between the diaphragm

and said shoulders, a stylus lever, and a connection between said stylus lever and that portion of the clip which projects beyond the outer face of the diaphragm.

- 5 11. The combination, in a sound box for talking machines, of the sound box casing and its perforated diaphragm, a clip consisting of a strip of sheet metal bent to form a shouldered loop with wings passing
10 through the diaphragm and bent down on the back of the same, a washer interposed between the diaphragm and the shouldered

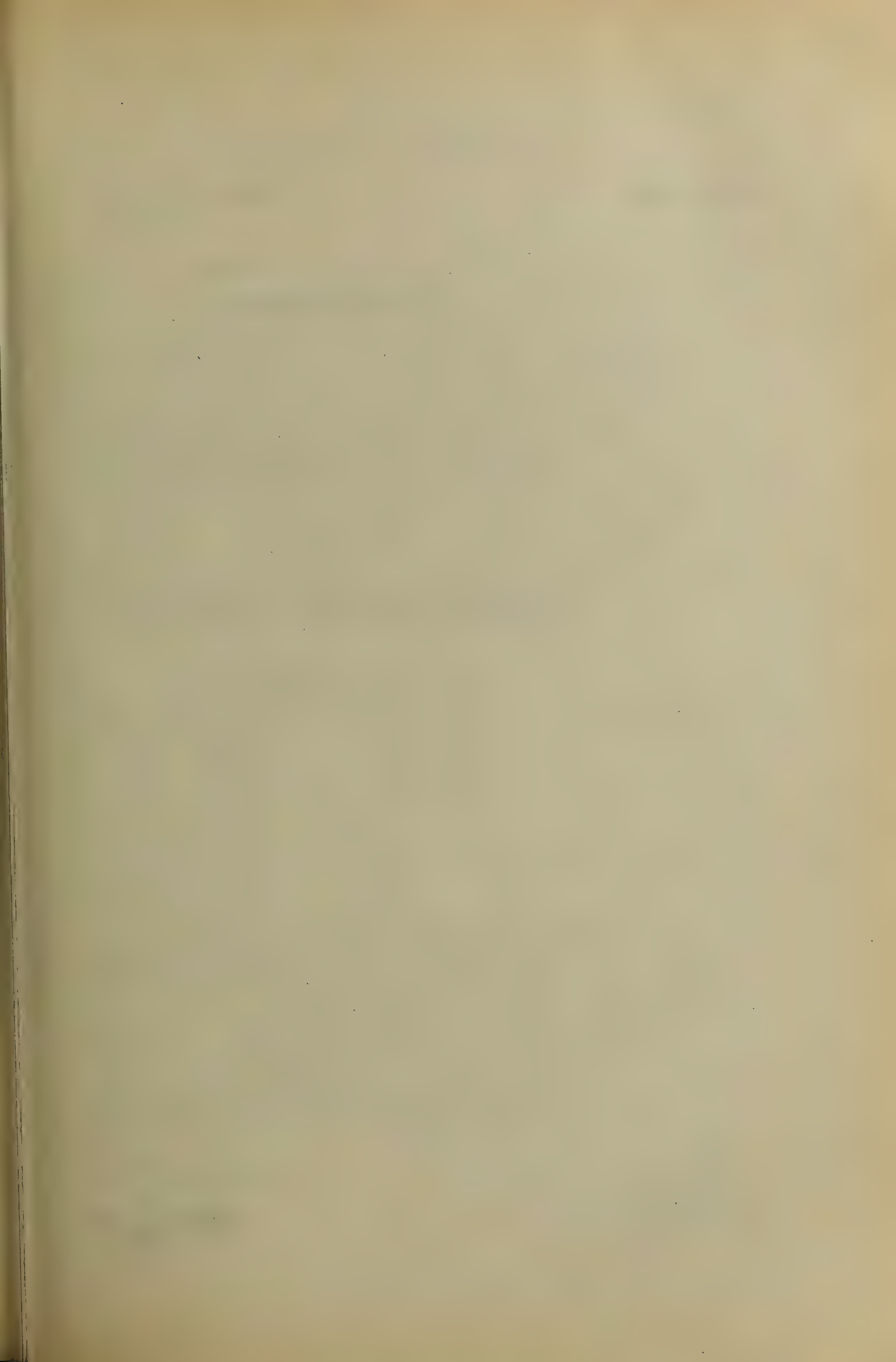
portion of the loop, a washer interposed between the diaphragm and the bent wings of the clip, a stylus lever and a connection between said stylus lever and the loop portion of the clip. 15

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

EDWIN H. MOBLEY.

Witnesses:

HAMILTON D. TURNER,
KATE A. BEADLE.



V. E. D'URSO.
SOUND AMPLIFIER FOR PHONOGRAPHS.
APPLICATION FILED OCT. 6, 1909.

956,235.

Patented Apr. 26, 1910.

3 SHEETS—SHEET 1.

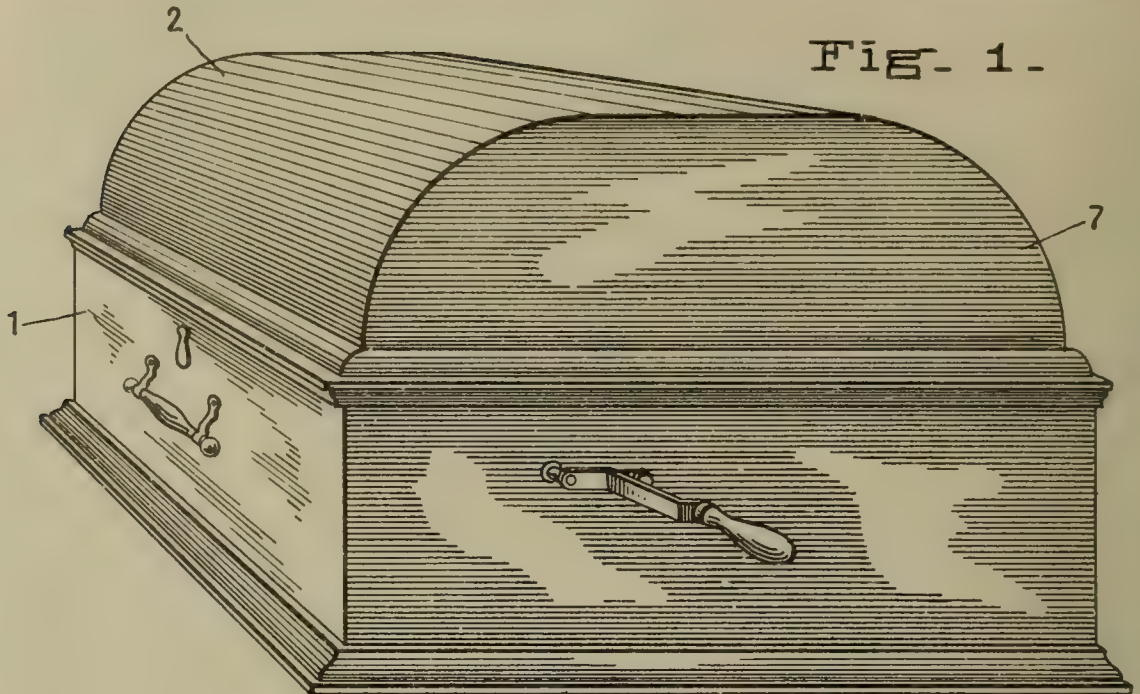


Fig. 1-

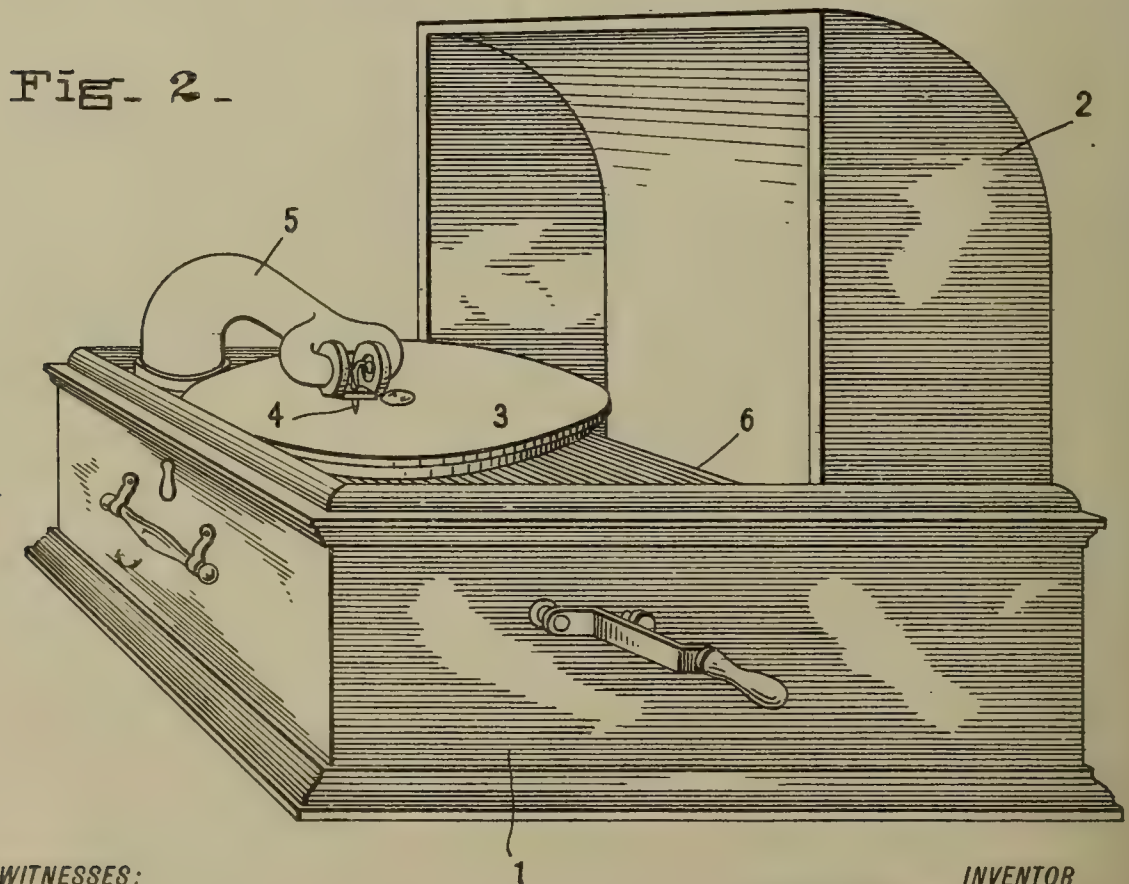
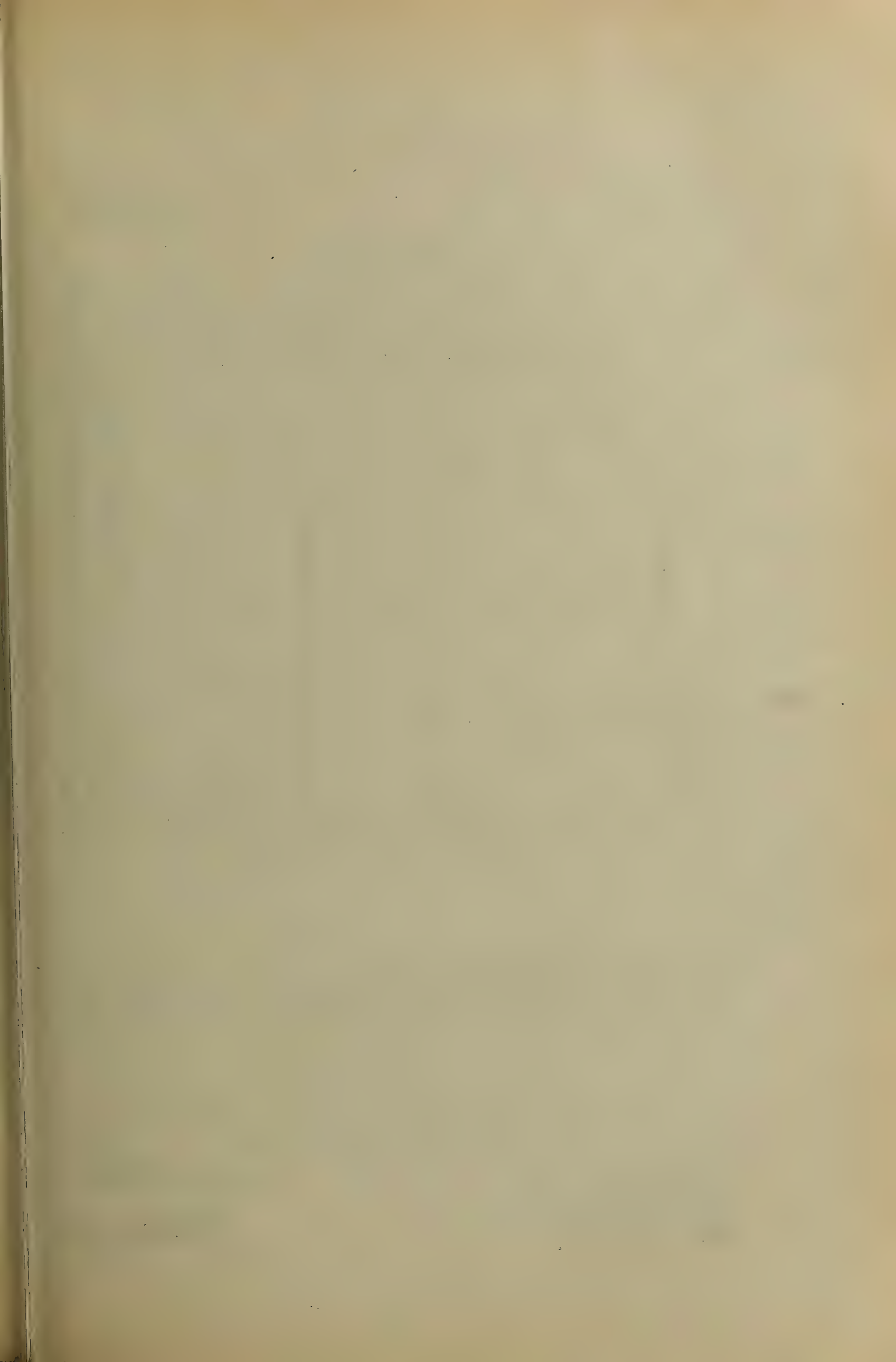


Fig. 2-

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K. Brenner

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Vito Ettore D'Urso.

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SOUND AMPLIFIER FOR PHONOGRAPHS.
APPLICATION FILED OCT. 6, 1909.

956,235.

Patented Apr. 26, 1910.

3 SHEETS—SHEET 2.

Fig. 3.

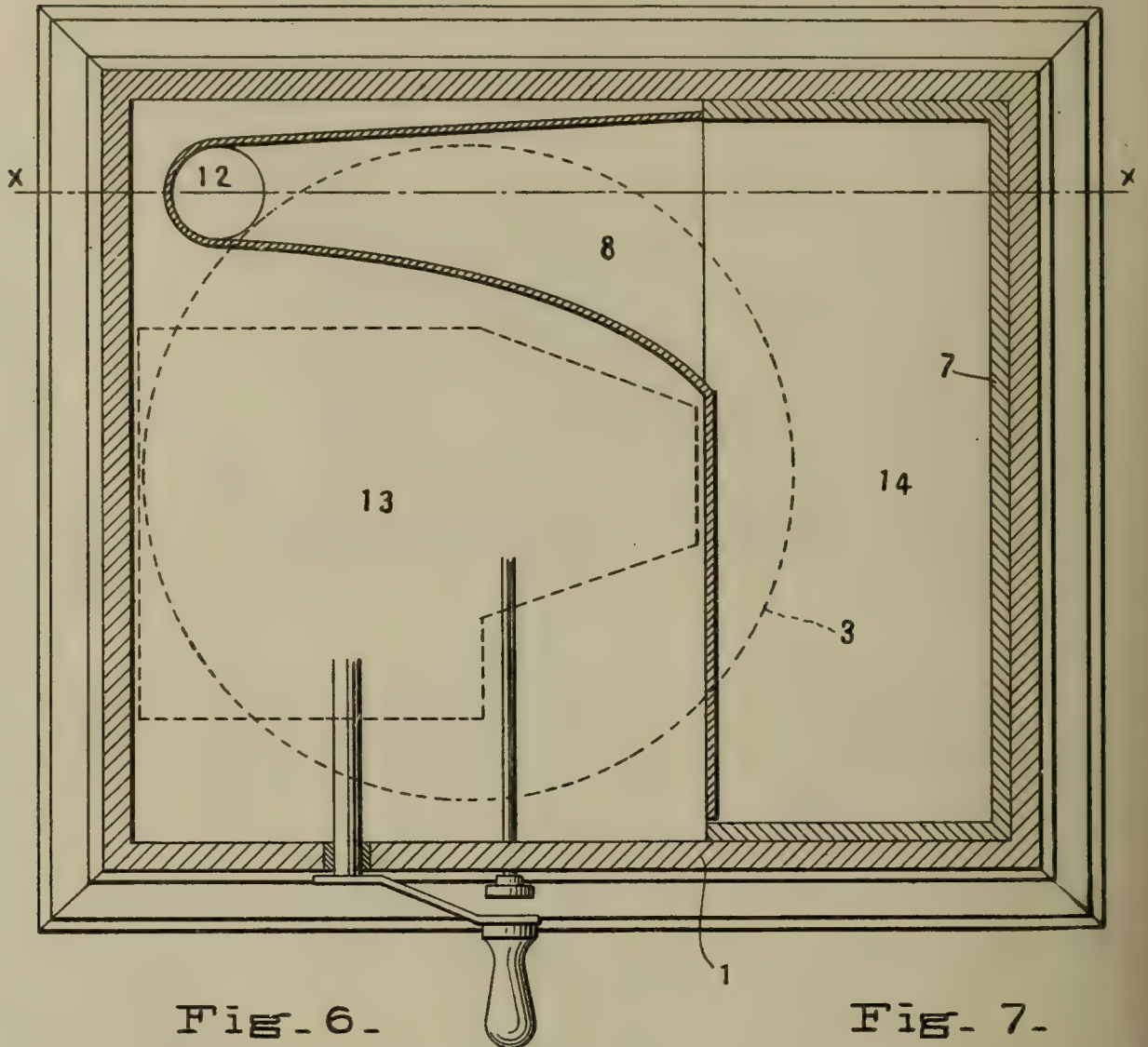


Fig. 6.

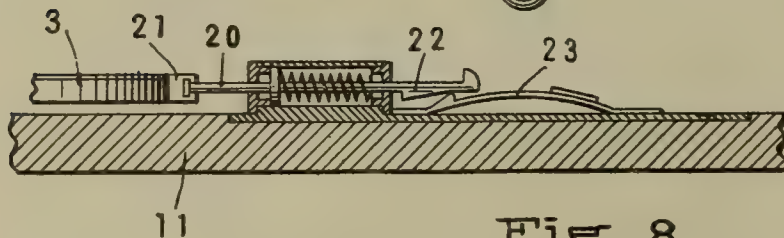


Fig. 7.

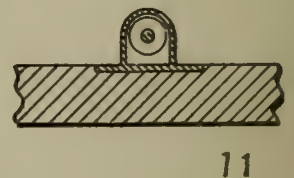
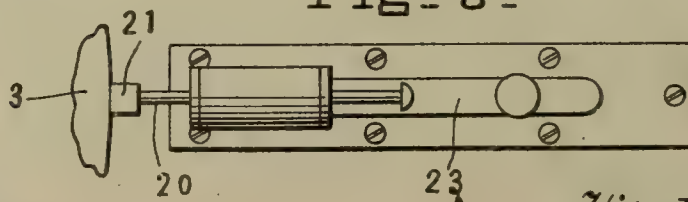


Fig. 8.



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SOUND AMPLIFIER FOR PHONOGRAPHS.
APPLICATION FILED OCT. 6, 1909.

956,235.

Patented Apr. 26, 1910.

3 SHEETS—SHEET 3.

Fig. 4.

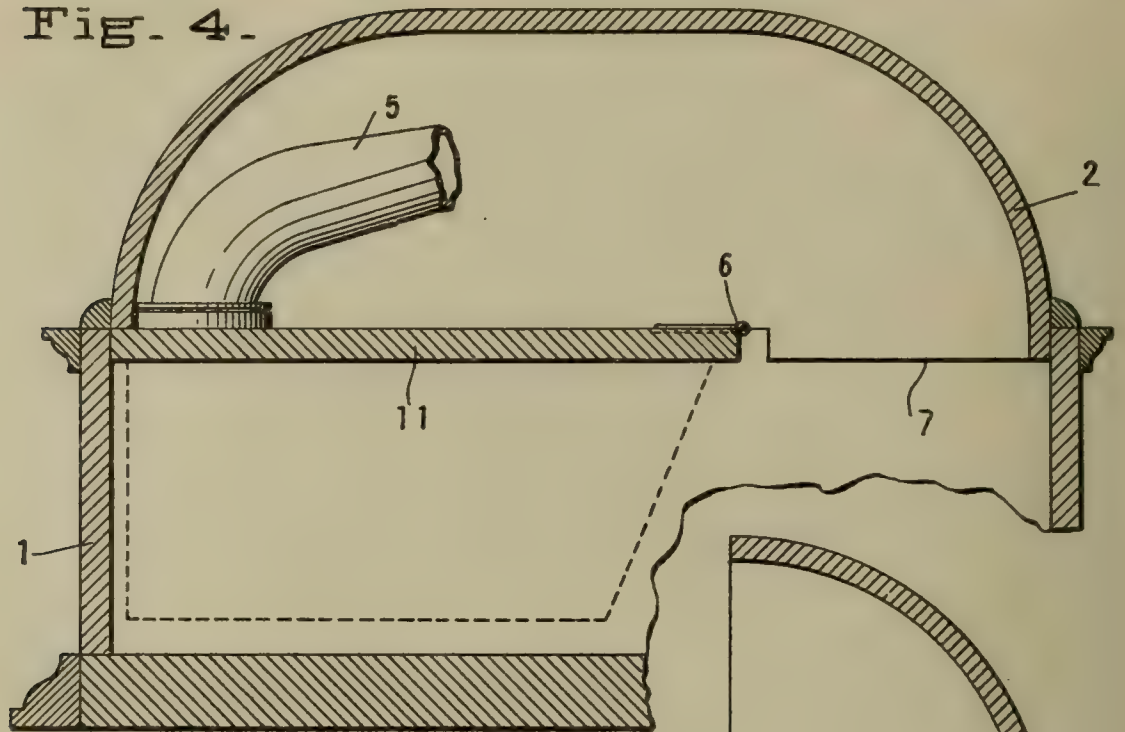
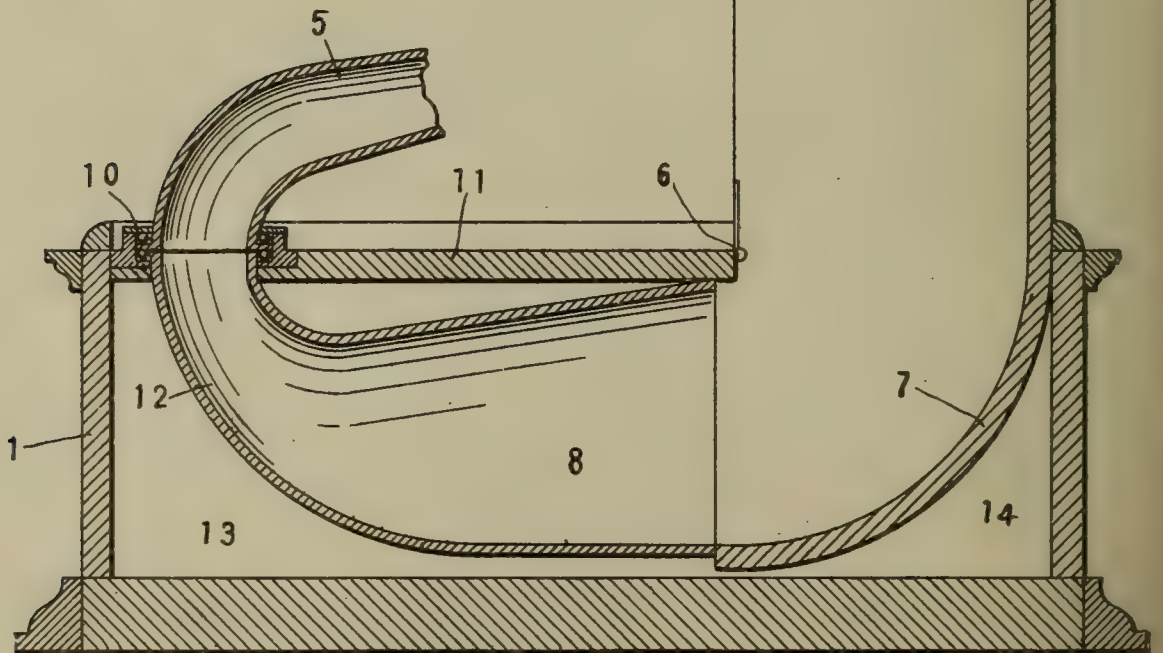


Fig. 5.



WITNESSES:

J. A. D'Urso
K. Brenner

INVENTOR

Vito Ettore D'Urso.

BY *W. B. Baker*
ATTORNEYS

UNITED STATES PATENT OFFICE.

VITO ETTORE D'URSO, OF NEW YORK, N. Y.

SOUND-AMPLIFIER FOR PHONOGRAPHS.

956,235.

Specification of Letters Patent.

Patented Apr. 26, 1910.

Application filed October 6, 1909. Serial No. 521,247.

To all whom it may concern:

Be it known that I, VITO ETTORE D'URSO, a subject of King Victor Emmanuel III of Italy, now residing in New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Sound-Amplifiers for Phonographs, of which the following is a full, clear, and exact description, whereby any one skilled in the art may make and use the same.

The invention relates to a device for amplifying the sounds resulting from the contact of a reproducer with a record and more particularly to a self-contained device, in which the inclosing casing for the mechanism co-acts to secure the amplifying effect of the sound which is induced by the reproducer of a phonographic instrument.

The objects of the invention are to provide a simple and compact device in which the inclosing casing may be utilized as a sound amplifier.

A further object is to provide a device which will dispense with the ordinary horn type of amplifier and secure the necessary amplification of sound by utilizing a direct channel for the transmission of sound from the disk or record through the inclosing casing of the device.

A still further object is to provide a casing in the form of a sound amplifier, which, in normal position, will inclose the parts of the mechanism and when opened for use will provide an amplifying or sound-board effect, which will give clear unobstructed tones.

Referring to the drawings: Figure 1 is a perspective view of the device illustrating the application of the amplifier. Fig. 2 is a similar view showing the casing in position to produce the amplification of sound. Fig. 3 is a plan view of the device illustrated in Figs. 1 and 2, partially cut in section and broken away to illustrate the sound-conducting channels. Fig. 4 is a transverse sectional view on the central line of Fig. 3. Fig. 5 is a sectional view on the line $x-x$ of Fig. 3. Fig. 6 is a detail view illustrating a stop for the record. Fig. 7 is a cross-sectional view through the mechanism illustrated in Fig. 6. Fig. 8 is a plan view of the mechanism illustrated in Fig. 6.

Ordinarily there is used in connection with a reproducer for phonographic instru-

ments, a horn or similar device for amplifying the sound emanating from the reproducer. Such devices must necessarily be supported with reference to the disk or cylinder record and owing to uncertain balance may effect the reproduction of sound, causing improper action of the reproducer and a scarring of the record. Furthermore, such horns as have been commonly used, accentuate the mechanical sounds of the instrument and give a more or less "brassy" or "tinny" effect to the reverberations induced by the reproducer, passing over the record. Furthermore, such devices are cumbersome and require adjustment with reference to the instrument and must be applied to or removed from the instrument for the purposes of ordinary transportation.

It is one of the primal objects of the present invention to provide a simple inclosing casing for the mechanism of the instrument which, when opened in an ordinary manner, will provide an amplifier for the sound producing mechanism which will have all of the ordinary benefits of a horn or like amplifier, without its disadvantages. The results are obtained by utilizing an inclosing casing having a cover, and when opened, will form a sounding-board or amplifier and will be directly connected through a channel within the main casing with the reproducer which coöperates with the record.

Referring to the drawings the numeral 1, denotes a main casing which is of ordinary rectangular form as shown herein, and is provided with a hinged cover 2, which incloses the record disk 3, reproducer 4, and supporting arm 5. One portion of the main casing is occupied by the motor and mechanical mechanism, not specifically shown herein, and the cover 2, when opened, is so hinged on a line 6, that its rear end 7, passes down into the main casing 1, and registers with an interior channel 8, which supports the reproducer.

In Fig. 1, the device is shown as completely inclosed and in condition for transportation. In Fig. 2, the device is shown with the sound amplifying cover tilted back forming the sounding-board for amplifying the sounds induced by the reproducer 4.

Obviously, any form of reproducer or disk or record may be utilized in connection with the amplifying device herein described, and, of course, the motor and mechanical parts

for rotating the disk or record of whatever form may be of any desired type in common use.

The reproducer is preferably mounted upon the arm 5, which is of tubular form suitably arranged upon ball-bearings or anti-friction-bearings 10, in the base or cover-plate 11, of the machine. Directly below the mounted end of the arm 5, and registering therewith is a tubular conduit 12, which connects with the chamber 14, arranged in one portion of the main casing 1, and of such a form that it will register with the end 7, of the cover 2, when the latter is opened. It will be seen from the above description that the main casing is really divided into two compartments, the compartment 13, being utilized for the mechanical parts for operating the records and the compartment 14, serving to receive the lower end of the cover 2, when it is tilted upon its hinged line 6. In other words, the cover is of reëntrant form hinged transversely in such a manner that when opened it will project into the compartment 14, and form a direct and inclosed sound-conveying channel from the reproducer 4. Being curved and of the proper form, it will receive the sound waves and deflect them outwardly, giving an amplifying effect which takes the place of the ordinary horn type of amplifier. At the same time, the amplifying device herein disclosed, forms a complete cover for the device.

Obviously, the inclosing casing and cover may be made from any desired material.

In Figs. 6 to 8, there is illustrated a form of stop device for the record which may be conveniently used in connection with the mechanism. This consists, briefly, of a plunger 20, having a buffer-face 21, adapted to come into or to be removed from contact with the supporting plate of the record. One end is provided with a latch 22, which, coöperating with a spring-latch 23, holds the plunger 20, in either of its positions of adjustment.

Obviously, the specific details of the mechanism may be varied to a considerable ex-

tent without departing from the spirit and intent of the invention, which contemplates an inclosing casing having various positions of adjustment, and providing a suitable sound amplifier, the whole mechanism, including the amplifier, being self-contained.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A sound amplifier for phonographs or the like embodying a cover hinged to a main casing and having a portion thereof adapted to project inwardly into said casing when the cover is opened, a conduit arranged in the casing and opening toward the inwardly projecting portion of the cover, and a sound reproducer connected to the opposite end of said conduit.

2. In combination with a casing for a sound reproducing mechanism, a cover therefor hinged intermediate its ends, said cover having a portion adapted to project into the casing when the cover is in open position, a conduit extending through the casing and opening toward the inwardly projecting portion of the cover and a reproducer arm connecting with said conduit.

3. In combination with a sound reproducing mechanism, a casing comprising a main casing and a cover, said cover adapted when open to extend downwardly within said casing and project above said casing, a sound conveying conduit arranged in said casing and opening toward the downwardly projecting end of the cover, and a reproducer mechanism connecting with said conduit.

4. In combination with a sound producing mechanism having a casing, and a sound-conveying conduit with a compartment connecting with said conduit, a cover hinged above said compartment and adapted to be swung as to its lower end into said compartment connecting with the conduit and a reproducer mechanism connecting with said conduit.

VITO ETTORE D'URSO.

Witnesses:

NICOLA FERRI,
FORORI J. SPIELER.

C. E. WEST, JR.
SOUND RECORDING AND REPRODUCING MACHINE.
APPLICATION FILED JUNE 3, 1907.

956,460.

Patented Apr. 26, 1910.

Fig. 1.

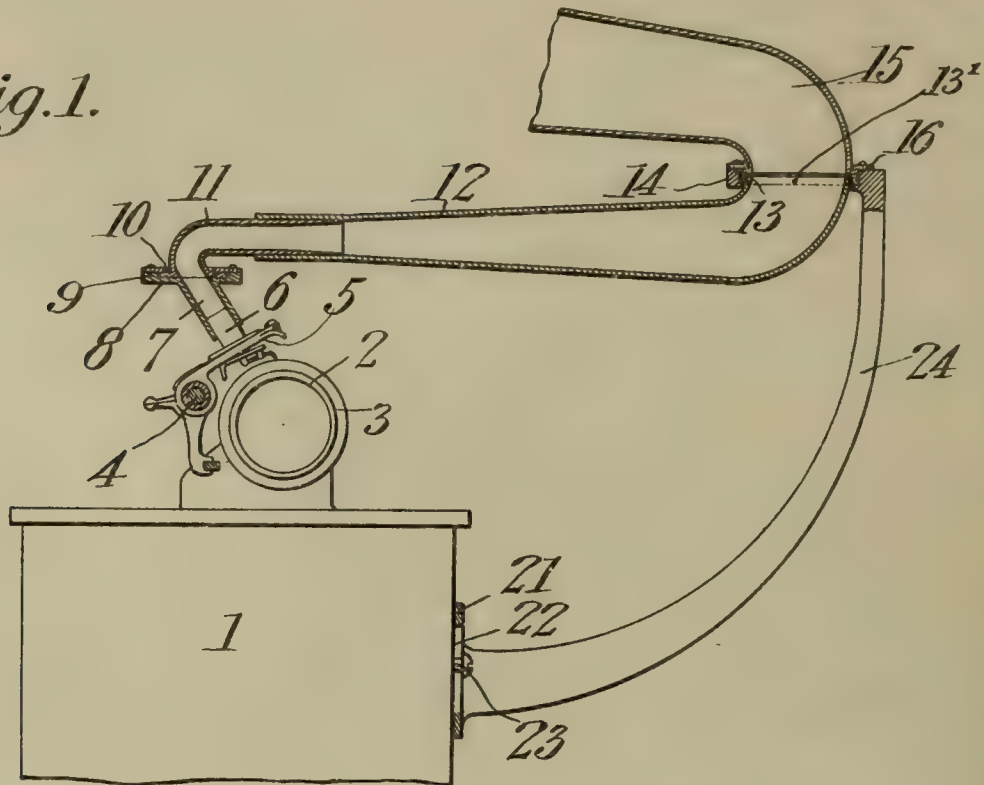


Fig. 2.

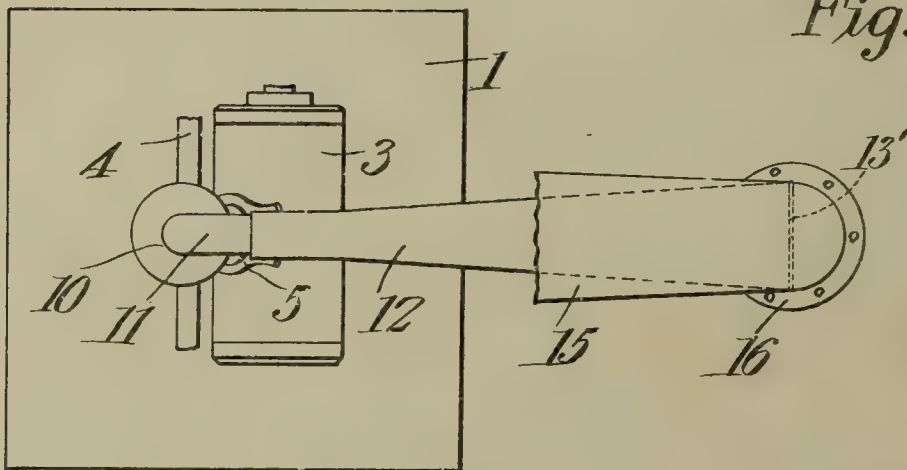


Fig. 3.

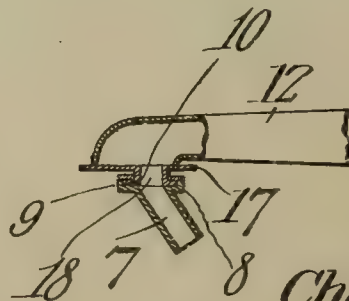
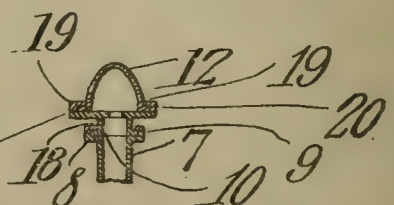


Fig. 4.



WITNESSES:

E. J. Schaub
F. J. Chapman

Charlie E. West Jr.,
INVENTOR

By *C. A. Snow & Co.*
ATTORNEYS

UNITED STATES PATENT OFFICE.

CHARLIE E. WEST, JR., OF HOPKINSVILLE, KENTUCKY.

SOUND RECORDING AND REPRODUCING MACHINE.

956,460.

Specification of Letters Patent.

Patented Apr. 26, 1910.

Application filed June 3, 1907. Serial No. 377,092.

To all whom it may concern:

Be it known that I, CHARLIE E. WEST, Jr., a citizen of the United States, residing at Hopkinsville, in the county of Christian and State of Kentucky, have invented a new and useful Sound Recording and Reproducing Machine, of which the following is a specification.

This invention has reference to improvements in sound recording and reproducing machines of the type where the recorder or reproducer is constrained to move in a right line across the record tablet.

The object of the present invention is to adapt to such a machine the type of sound amplifier wherein either the amplifier as a whole is movable in one plane only about a vertical axis, or one member only is movable to any point of the horizon and the other member is moved by the sound box as it travels across the record tablet, and both members coact to constitute a single continuously-expanding sound horn or amplifier.

The invention consists essentially in providing a sound reproducing or recording machine of the type wherein the sound box is positively propelled across the record in a straight line with a taper horn movable in one plane only or with a swinging taper arm connection forming a part of a sound amplifier, the other part of which connects at its smaller end with the large end of the taper arm and is expanded into an open mouth or bell of usual type.

The invention comprises a connection between the sound box and the taper arm whereby the latter is permitted to move about a vertical axis so that its smaller end, adjacent to the sound box, describes an arc and, therefore, changes its relation with the sound box. This connection is so related to the taper arm that it will move relatively into and out of the same to permit the arm to travel through a curved path, and it will also have a relative movement with relation to the sound box itself, so as to have a relative movement to the sound box about an axis perpendicular to the axis of the sound box.

The invention will be fully understood from the following detailed description taken in connection with the accompanying

drawings forming part of this specification, in which,—

Figure 1 is a side elevation, partially in section, of a sound reproducing machine with my invention applied thereto, unessential parts being omitted; Fig. 2 is a plan view of the same; Fig. 3 is a longitudinal section, partly in elevation, of a modified form of my invention; and Fig. 4 is a cross section of the structure shown in Fig. 3.

Referring to the drawings, there is shown a case 1 such as is usually provided with sound recording or reproducing machines, and containing the motor for driving the same. Upon the top of this machine there is suitably mounted for rotation a sound-record tablet support or mandrel 2, shown in the drawings as carrying a cylindrical sound-record 3. Carried upon a suitable feeding mechanism 4, such as is usually employed in machines using cylindrical record tablets, there is a sound box 5 shown in the drawings as a reproducer sound box but which may, of course, be a recording sound box. The sound record support and the sound box and its support and feeding mechanism constitute in themselves no part of the present invention and may be of any commercial type found in the machines using cylindrical record tablets; that is, in machines where the sound record is rotated upon an axis but is not movable longitudinally thereon and the sound box is fed in a right or straight line across the record parallel with the axis thereof when cylindrical records are used, or on a radius thereof when flat or disk-shaped records are used. The sound box 5 is provided with a neck 6 of the usual type, designed to convey the sound to or from the diaphragm, from or to the horn or sound amplifier. In machines of this type the sound box is usually so supported that the neck 6 stands at an angle to the vertical, and in the machine constructed in accordance with my invention this neck 6 is received in one end of a short tube 7, the other end of which is formed with a circumferential flange 8 terminating in a thickened periphery 9. The portion of the flange 8 interior to the thickened portion 9 constitutes an annular seat for the flanged end 10 of a short tube 11, so bent that when the flanged end 10 is seated upon the flanged

end 8 of the tube 7, this flanged end 10 will be in line with the tube 7 and the other end of the tube 11 will lie in a horizontal plane. The horizontal portion of the tube 11 enters the smaller end of a taper arm 12, such as is commonly used upon sound reproducing machines of the type where disk-shaped records are employed, and the record groove itself constitutes a feeding means for propelling the taper arm around a vertical axis.

The large end of the arm 12 is formed with a neck portion entering a ring 13 resting on an annular shoulder formed in a ring 14, which latter is formed on or carried by the upper end of a bracket 24 fast at its other end to the case 1 of the machine. Passing diametrically through the neck of the arm 12, and the ring 13, parallel to the case 1, there is a pin 13'. By this structure the arm 12 may turn upon a vertical axis to as great an extent as desired, and also has a limited movement on a horizontal axis. Above the shoulder supporting the ring 13 the ring 14 has another shoulder formed therein upon which is supported the smaller end of an amplifying horn section 15, of the usual type but of which only a portion is shown in the drawings. In order to hold the horn section 15 in place, there is secured to the upper side of the ring 14 a retaining ring 16 which, in order to be applied around the end of the horn 15, is made of two parts and secured to the ring 14 by screws or in any other manner desired.

The mounting of the horn 15 permits it to be moved around a vertical axis coincident with the center of the ring 14 to any point of the horizon desired, and the mounting of the taper arm 12 is such that it may be swung around the same axis. The meeting ends of the larger part of the taper arm 12 and the smaller part of the horn section 15 are coincident, and these two parts 12 and 15 so formed as to constitute a sound amplifying horn, for the sound waves, of constantly increasing diameter from the smaller end of the taper arm to the bell end of the horn section 15. The tube 11 is free to move longitudinally within the smaller end of the taper arm 12, and for this purpose the exterior of the tube 11 and the interior of the taper arm 12, where the tube 11 is movable within the arm 12, are made cylindrical so that the tube 11 is supported by the arm 12 and has sufficient range of longitudinal travel therein to adapt it to the particular machine to which the invention may be applied.

When the sound box is fed across the record positively in the usual manner, it carries with it the tube 7, the tube 11 and the taper arm 12, which latter, it is to be understood, then moves in a horizontal plane

only. Since the sound box moves across the record in a straight line and the taper arm 12 has its smaller end moving through an arc, there is a corresponding change in the relative positions of the sound box and the taper arm. This is provided for by the tube 11 which is capable of moving longitudinally into and out of the small end of the taper arm 12, and also by the manner of mounting the end 10 of the tube 11 in the seat provided therefor at the upper end of the tube 7, this permitting a certain axial movement of the tube 11 with relation to the tube 7 on a vertical axis about the joint formed between the flanged end 10 and its seat in the flange 8.

It will be seen that by this invention there is provided a large amplifying horn within a constricted space, whereby the floor space of the machine is very considerably reduced from that of a machine provided with a straight amplifying horn supported upon a suitable stand either attached to the machine or separate therefrom. Also, the sound box and those parts carrying the same are relieved from the weight of the horn, which is often considerable even where an attempt is made to counterbalance the horn.

While that portion of the sound-transmitting space between the sound box and the smaller end of the taper section 12 of the amplifying horn, occupied by the tubes 7 and 11, is approximately of constant diameter, as shown in the drawings, these connecting parts may be made of constantly increasing diameter to conform to an extent to the taper of the arm 12, but in practice the short extent of sound conduit of constant diameter has been found to not interfere to a marked degree with the purity and freedom of the tone. The connecting parts between the sound box and the amplifying horn, if made of one diameter throughout, should be made as short as possible, since it is found that where the tubular conduit of constant diameter is of any considerable length there is a muffling or obscurity of tone which is very detrimental to the best reproduction of sound.

In Figs. 3 and 4 there is shown a modified form of the invention whereby the tubular portion 11 is omitted and the tubular portion 7 is connected directly to the smaller end of the taper horn section 12. In the structure shown in these figures the upper end of the tube 7 has a flange 8 with a thickened periphery 9, as in Fig. 1. The tube 11 of Fig. 1 is replaced by a plate 17 having a short tubular neck 18 terminating in a flange 10 seated on the flange 8. The plate 17 projects for a distance to each side of the tube 7 and to a longer distance at the front and back thereof. The plate 17 is provided on its longer sides with overhanging flanges 19 forming a channel for receiving the out-

turned edges 20 at the smaller down-turned end of the taper section 12. The construction is such that the small end of the taper arm moves in a longitudinal direction in the flanges or channels 19, so that a sound box seated in the lower end of the tube 7 may move in a straight line across the record tablet while the taper arm end moves about an arc struck from the axis of the arm.

The swivel joint between the tube 7 and neck 18 provides for the slight relative movement of rotation between the horn section 12 and the sound box neck.

The down-turned end of the horn section 12 is elongated in the direction of the length of the taper arm 12 to permit the necessary extent of longitudinal movement with relation to the plate 17, and the said plate 17 should be made long enough to always cover the down-turned end of the taper arm section or a suitable slot therein whatever the relative position of the opening in the horn to the opening in the plate 17 may be.

In order to provide for the adjustment of the bracket 24 so that the height of the taper arm 12 with relation to the sound box may be properly adjusted, the said bracket 24 is provided at its point of connection with the case 1 with flanges 21 in which are formed elongated slots 22 and screws or bolts 23 pass through these slots 22 and into the case 1 and coact with the slots to permit the vertical adjustment of the bracket 24.

While it has been customary heretofore to provide the two-part amplifying horn with a taper section movable in one plane only for sound reproducing machines of the disk type, by the present invention such a horn with all the advantages attending its use, is adapted to both sound recording and reproducing machines of the type using cylindrical records.

The proportions of the several parts may be changed to adapt the invention to various types of talking machines.

I claim:—

1. In a sound recording and reproducing machine, a taper horn section movable in one plane only, a sound box movable across the record in a straight line only, and a connecting neck between the sound box and the horn section movable longitudinally in the latter and composed of two parts swiveled together at a point between the sound

box and the horn section, one part being freely rotatable as a whole relatively to the other at the swivel connection on an axis perpendicular to the plane of movement of the horn section.

2. In a sound recording and reproducing machine, a taper horn section constrained to move in one plane only about a vertical axis, a sound box constrained to travel across a sound record in a straight line parallel to the plane of movement of the horn section, a tubular connection carried by the smaller end of the horn section and movable longitudinally with reference to the same, another tubular connection carried by the sound box, and a swivel joint between the two tubular connections having its axis of rotation perpendicular to the plane of movement of the horn section.

3. In a sound recording and reproducing machine, a taper arm constituting a portion of the sound-amplifying means and constrained to move in one plane only, a sound box constrained to move in a straight line across the record tablet, a tubular sound-conveying section carried by the small end of the taper section and movable longitudinally with reference thereto, another tubular section connected to the sound box and provided with an annular seat at one end receiving the end of the first-named tubular connection remote from the taper arm, and means for holding the two tubular sections together.

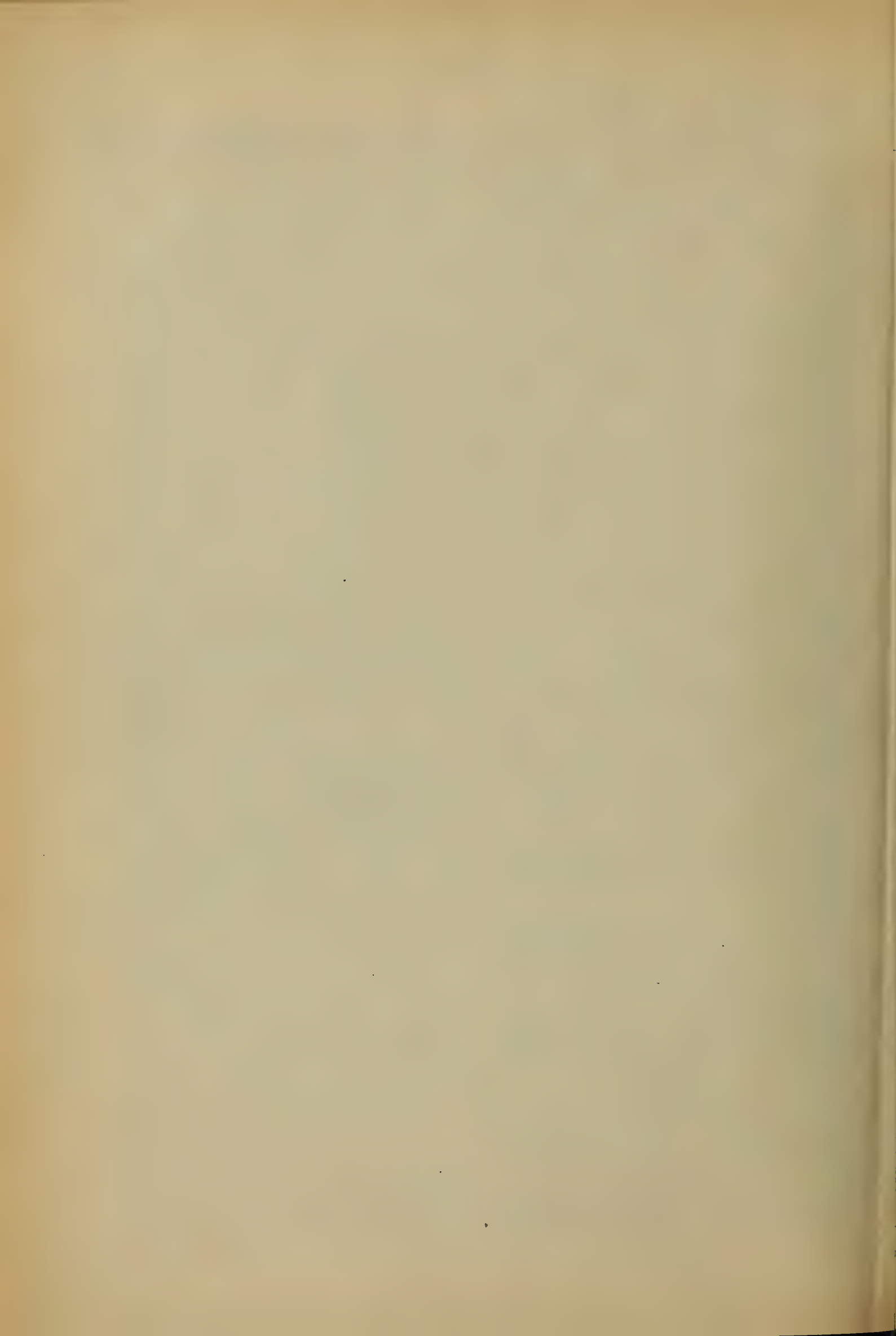
4. In a sound recording and reproducing machine, a two-part sound amplifier having one section connected at its smaller end to the sound box and formed with an annular flange at its larger end, a supporting ring or collar provided with an annular seat for the flange, another horn section having its smaller end provided with an annular flange and provided with an annular seat of larger diameter than the seat for the other horn section and contiguous thereto, and means for confining the flanges on the horn section in juxtaposed relation.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

CHARLIE E. WEST, JR.

Witnesses:

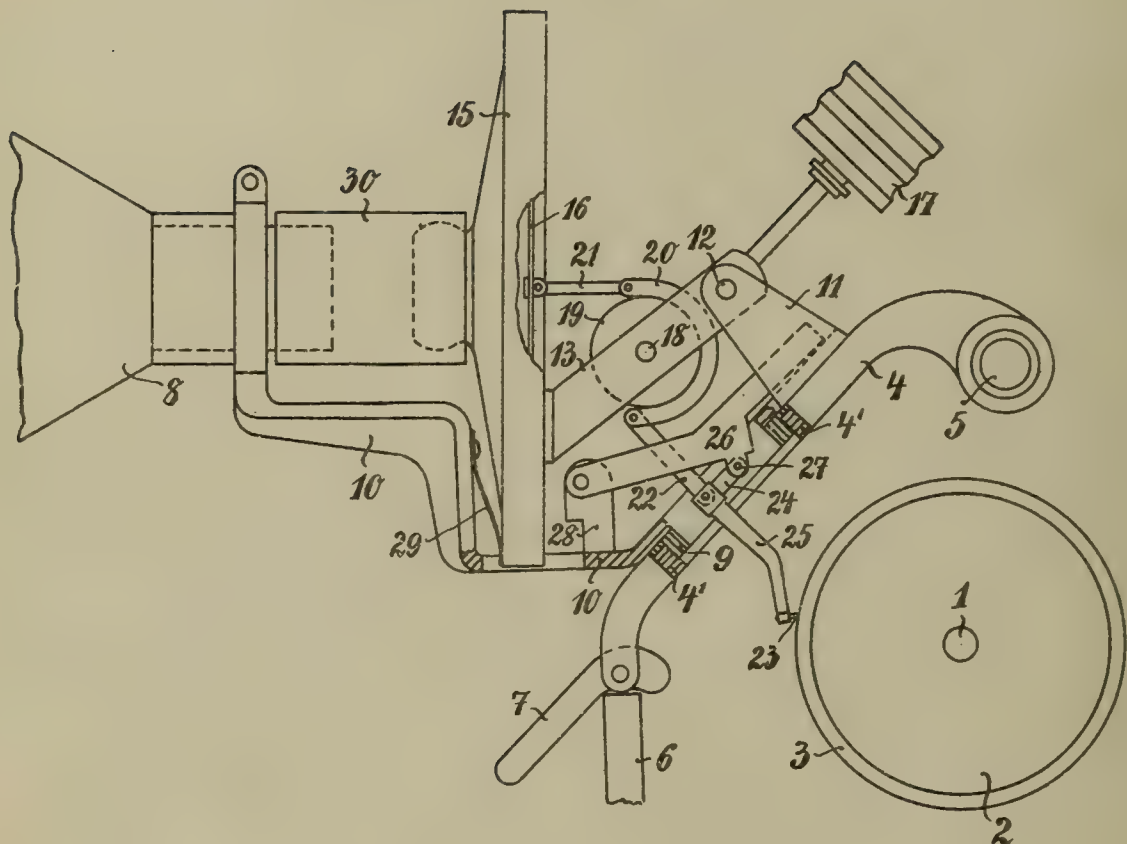
EDWARD W. CLARK,
GEORGE E. F. JONES.



R. BERNDT.
 PHONOGRAPH.
 APPLICATION FILED NOV. 15, 1909.

956,671.

Patented May 3, 1910.



Witness
 Clarence Humick
 Mac W. Clinton

Reinhold Berndt
 Inventor
 By Samuel E. Starky
 his Attorney

UNITED STATES PATENT OFFICE.

REINHOLD BERNDT, OF BERLIN, GERMANY.

PHONOGRAPH.

956,671.

Specification of Letters Patent.

Patented May 3, 1910.

Application filed November 15, 1909. Serial No. 528,247.

To all whom it may concern:

Be it known that I, REINHOLD BERNDT, manufacturer, a citizen of Germany, residing at Berlin, Germany, have invented new and useful Improvements in Phonographs, of which the following is a specification.

This invention relates to phonographs with a device for strengthening the sound by means of a friction disk continuously driven from the motor and arranged between the needle and the membrane, all the parts concerned in the strengthening of the sound (the needle, the friction disk, the brake band and the membrane) being mounted in a common frame.

The purpose of the invention is to render the movements of the needle due to unevenness in the phonogram surface (*e. g.* an Edison cylinder) harmless, which movements when a frame is used which cannot follow them must cause alterations in the magnitude of the friction and therefore of the sound strengthening. The most obvious solution of this problem would be to make the whole frame oscillatory, as is usual with ordinary sound boxes, balancing the frame by means of a counter weight. If this is done, however, particularly if the trumpet is mounted upon the frame a very large mass is required to be moved. According to the invention therefore, only the friction disk and the membrane are arranged in this way, being pivoted for this purpose upon an oscillating part of the frame together with a counter weight while the axis of the needle is left as before in an immovable part of the frame.

The invention is illustrated in the accompanying drawing in one form of construction which is suited for the well known Edison cylinder.

1 indicates the axle of the cylinder cone, 2 the cone itself, 3 the cylinder, 4 the carrying arm movable upon the rod 5, 6 the supporting guide, 7 the disengaging lever and 8 the trumpet. In place of the sound box hitherto usual there is provided in a ring 4' of the carrying arm, a ring 9 which carries the supporting frame 10 for all the members necessary for the reproduction and strengthening of the sound. The immovable part of this supporting frame is bent at an angle and carries on the one hand the trumpet 8 and on the other hand two lugs 11. In these latter is mounted an axle 12 for the oscillating part of the frame which consists essen-

tially of two cheeks 13. These are rigidly connected on the one hand with the frame 15 of the membrane 16 and on the other hand with a balance weight 17, and they carry also an axle 18 for the friction disk 19. The friction band 20 which rests upon the disk 19 is connected by rods 21, 22, on the one hand with the membrane 16, and on the other hand with the angle lever 24, 25 carrying the needle 23. This angle lever is pivoted at 27 upon a weighted lever 26 (or a spring) which is hinged to a lug 28 of the frame 10. It is desirable also to insert a spring 29 between the frame and the sound box 15. If there are any inequalities in the cylinder 3 they cause the needle 23 to turn first about the axle 27 and these oscillations are transmitted through the rod 22 to the brake band 20, through this latter to the friction disk 19 and the members mounted with it in the cheeks 13, producing a revolution of these parts about the axle 12. Such revolution is rendered possible by a short tube 30 which connects the mouths of the sound box 15 and the trumpet 8. The transference of such inequalities, however, is damped from the start by the yielding mounting of the axle 27 of the angle lever 24, 25 carrying the needle 23, upon the weighted lever 26.

The present invention further attains the special advantage that the revolution of the friction disk 19 which is continuously driven from the driving mechanism causes the oscillating part 13 to lift and so largely relieves the needle 23 of stress, in consequence of the braking effect of the band 20 and the manner of suspension. For instance if the friction disk 19 is turned clockwise it tends to take the band 20 with it in the same direction on account of the friction. As a result there is a turning moment upon the cheeks 13 which bear the disk 19 about the axis 18. The cheeks 13, however, cannot turn about this axis but only about the axle 12, so there is a tendency to revolve about this axis also in a clockwise direction but to a correspondingly diminished extent. The needle 23 can with this arrangement follow every inequality of the record 3 but requires a very much smaller pressure than heretofore, in order to transmit the oscillations. Consequently the phonograph record wears much more slowly. In the position of rest the movable part 13 may rest upon the angle lever 24, 25 from which it is lifted by the

revolution of the friction disk 19. The driving of the friction disk 19 from the driving shaft can be effected in known manner by means of a correspondingly movable coupling, or instead from a special driving motor which is also mounted upon the part 13 and the weight of which must be balanced by a corresponding counter weight.

I claim:

10 1. In a phonograph, the combination with a record, a needle coöperating therewith, and a diaphragm, of a carrying arm, an oscillatory support mounted on the carrying arm, the diaphragm being carried by said oscillatory support, a rocking support for the
15 needle, a friction disk carried by the diaphragm support, and a band operating over said disk and respectively connected to the diaphragm and needle.

20 2. In a phonograph, the combination with a record, of a diaphragm a counterbalanced oscillatory support therefor, a friction disk carried by said support, a needle coöperating with the record, and a band operating
25 over the disk, and connected, respectively, to the diaphragm and needle.

3. In a phonograph, the combination with a record, of a diaphragm, a support therefor, a pivoted carrier arm, said support being
30 mounted for oscillatory movement on said arm, a friction disk carried by said support, a needle coöperating with the rec-

ord, a movable support for the needle, and a band operating over the friction disk and connected, respectively, to the diaphragm 35 and needle.

4. In a phonograph, the combination with a record, of a diaphragm, a support therefor, a pivoted carrier arm, said support being mounted for oscillatory movement on
40 said carrier arm, a friction disk carried by said support, a needle coöperating with said record, a movable support to which the needle is pivotally connected, and a band operating over the friction disk, and connected, respectively, to the needle and dia-
45 phragm.

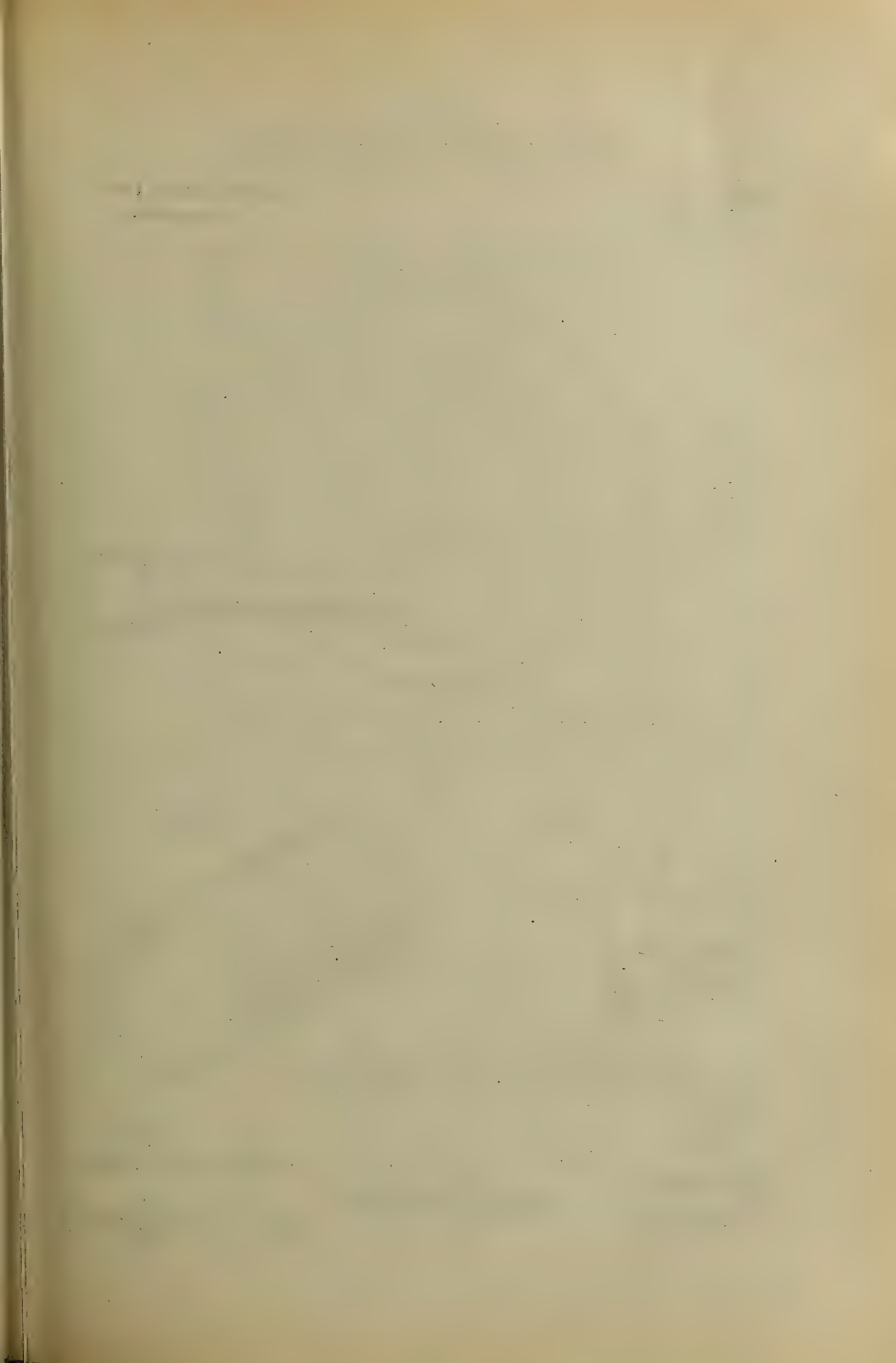
5. In a phonograph, the combination with a record, of a pivoted supporting arm, a frame carried thereby, a rocking support carried by
50 said frame, a diaphragm carrier supported on said rocking support, a needle also pivotally connected to said frame, and means carried by the diaphragm support, and connected, respectively, to the diaphragm and needle,
55 for relieving the pressure of the needle against the record.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

REINHOLD BERNDT.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.

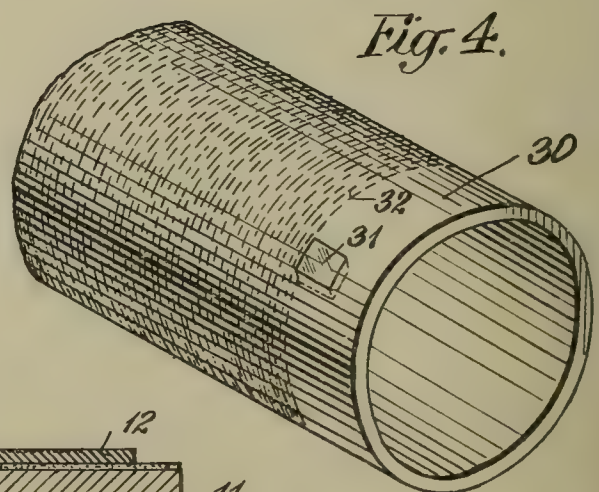
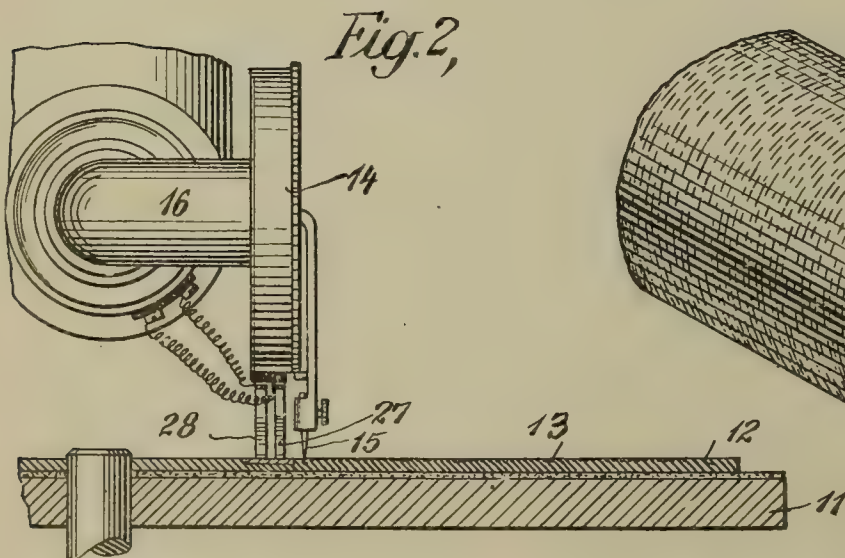
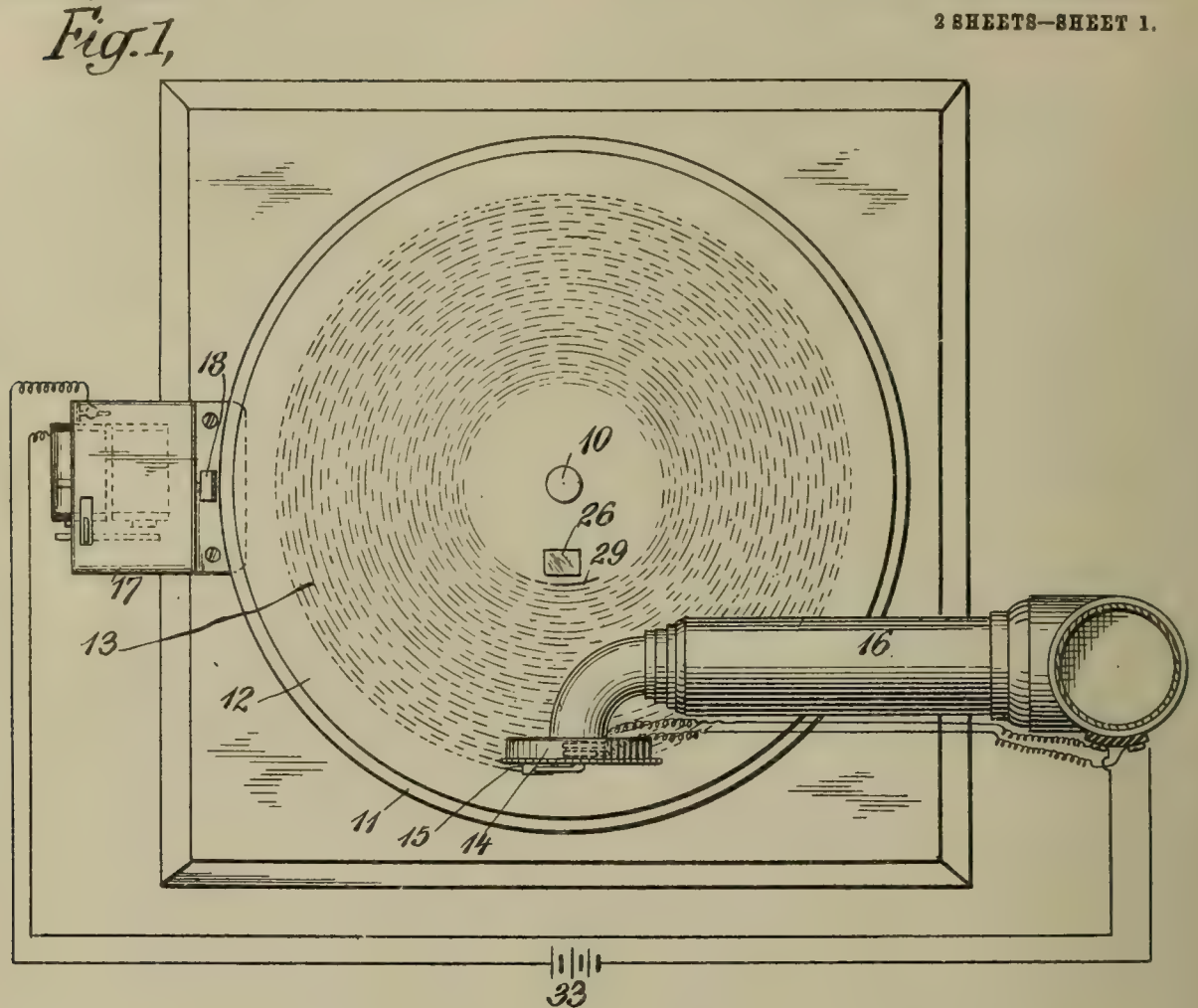


F. H. OSBORN.
 SOUND REPRODUCING MACHINE AND RECORD THEREFOR.
 APPLICATION FILED DEC. 4, 1908. RENEWED JAN. 26, 1910.

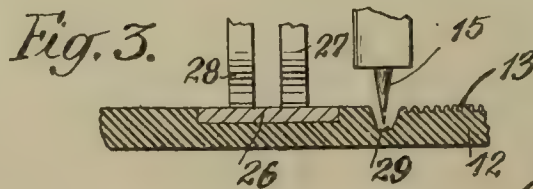
956,727.

Patented May 3, 1910.

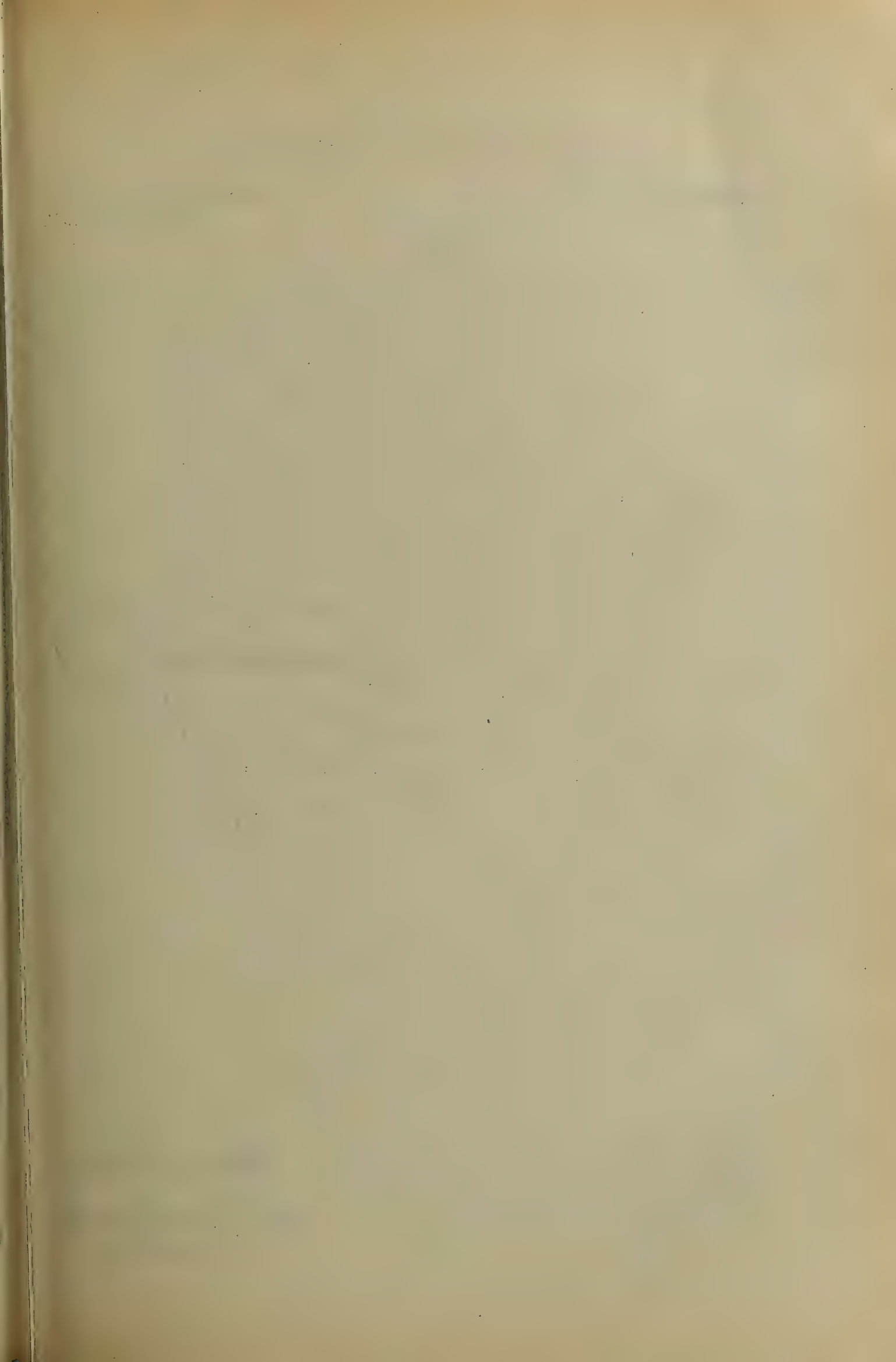
2 SHEETS—SHEET 1.



WITNESSES:
Y. Sandusky Jr.
F. Graves.



INVENTOR
Federick H. Osborn
 BY
Chapin Hayman
 ATTORNEYS



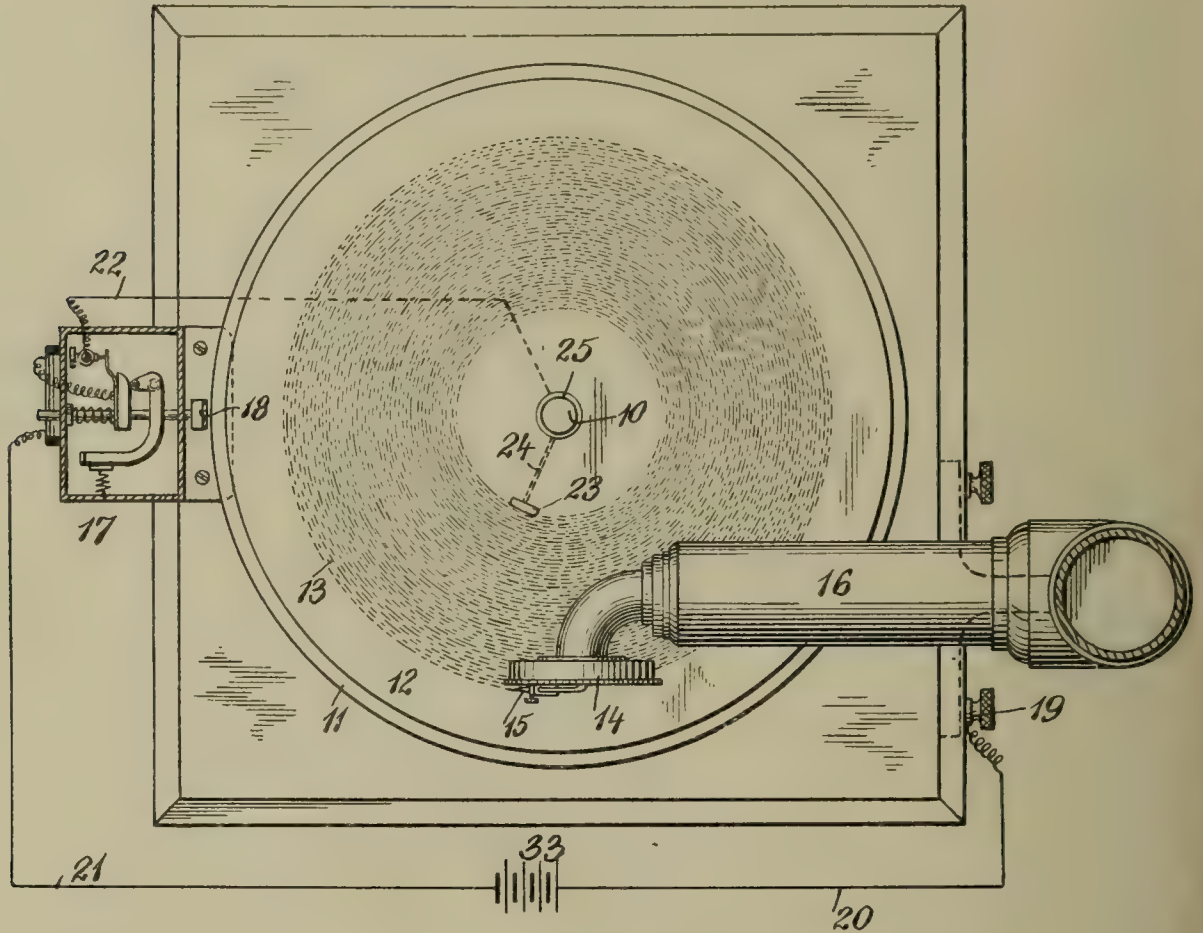
F. H. OSBORN.
SOUND REPRODUCING MACHINE AND RECORD THEREFOR.
APPLICATION FILED DEC. 4, 1908. RENEWED JAN. 26, 1910.

956,727.

Patented May 3, 1910.

2 SHEETS—SHEET 2.

Fig. 5,



WITNESSES:

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SOUND-REPRODUCING MACHINE AND RECORD THEREFOR.

956,727.

Specification of Letters Patent.

Patented May 3, 1910.

Application filed December 4, 1908, Serial No. 465,921. Renewed January 26, 1910. Serial No. 540,272.

To all whom it may concern:

Be it known that I, FREDERICK H. OSBORN, a citizen of the United States of America, and a resident of Garrison, county of Putnam, and State of New York, have invented certain new and useful Improvements in Sound-Reproducing Machines and Records Therefor, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to improvements in sound reproducing machines and records therefor, and particularly to means therein for automatically stopping the machine upon the completion of a sound reproducing operation.

My invention consists in providing electrical circuit closing means including a member carried by the reproducer, which is held normally out of contact with the face of the record while the stylus of the reproducer is traveling along the greater portion of the sound groove in the said record, and in deepening the groove, at the inner end thereof, whereby the stylus in entering the deeper portion of the groove will cause the said member to be lowered to engage the face of the record and thereby to close circuit, by means of which an electrical stopping device is put into operation.

The object of my invention is to automatically stop the movement of the record at a predetermined point by an electrical means, circuit for which is closed by the coaction of some portion of the record itself with the sound reproducer or traveling arm while at the same time avoiding the employment of any portion for this purpose which projects above the face of the record, and also without employing the stylus itself as a part of the electrical circuit.

In order that my invention may be fully understood, I will now proceed to describe certain embodiments thereof, having reference to the accompanying drawings illustrating the same, and will then point out the novel features in claims.

In the drawings: Figure 1 is a partial top view and partial horizontal section of a sound reproducing machine having electrical stopping means embodying my invention. Fig. 2 is a detail vertical transverse section therethrough. Fig. 3 is an enlarged transverse section through the record at the circuit closing point therein. Fig. 4 is a detail perspective view, showing a portion of a

cylindrical record having a circuit closing element therein. Fig. 5 is a view similar to Fig. 1, of a modified form of the machine.

The machine illustrated comprises a vertical shaft 10 which is rotated by a suitable motor, not shown; a table 11 secured to rotate therewith; a record 12 mounted upon the table, the said record 12 having the usual sound groove 13 therein; a reproducer 14; a stylus 15, carried by the said reproducer, and a swinging or traveling tone arm 16 which carries the said reproducer. An electrically operated stopping device 17 including a brake member 18 is mounted in proximity to the periphery of the table 11, the brake being adapted to be tripped electrically upon the closing of an electric circuit. This device is fully described and claimed in U. S. Patent No. 904,890 granted to me November 24, 1908. The circuit for the electric closing device may be traced from one side of a generator 33 to the stopping device 17, thence from the stopping device to a circuit terminal 27, thence from another circuit terminal 28 back to the generator 33.

The record disk 12 is provided with a circuit closing element 26 which is located in proximity to the end of the sound groove 13, the said circuit closing element being preferably a metallic strip which is molded right into the record, with the face thereof flush with the face of the said record. In the specific construction shown in Figs. 1 to 4 inclusive this element 26 has no normal electrical connection with any other part, but it is adapted to act as a bridge piece to close circuit between the two terminals 27 and 28 when the tone arm and sound box carried thereby have swung inward in the operation of the machine, to a point wherein the stylus has reached the termination of the sound groove 13. When the bridge piece thus closes circuit through the terminals 27 and 28 the circuit through the electrically controlled stopping device 17 will be completed and the brake member 18 will be caused to engage the periphery of the table 11, thereby stopping the machine. It will thus follow that by properly positioning the element 26 with respect to the end of the sound groove, the machine will always be automatically stopped regardless of the length of the record or the position of the traveling arm with respect to any fixed point in the machine. Because it is undesirable that the terminals 27 and 28 which are preferably in the form

of flexible brushes, should be normally in contact with the face of the record, and it is also undesirable that the element 26 should project beyond the face of the record, I have
 5 so mounted the brushes 27 and 28 with respect to the stylus that they will be normally held out of contact with the face of the record while the stylus is traveling along the groove in the reproduction of sound, but I
 10 have deepened the terminal portion 29 of the groove (see particularly Fig. 3) whereby the sound box will be permitted to drop when the stylus reaches this portion of the groove, to an extent sufficient to permit the brushes
 15 to drop into contact with the bridge piece 26. By this means the brushes 27 and 28 may be normally held well away from the face of the record and prevented from trailing thereover, while they will be brought surely and
 20 positively into engagement with the element 26 when the end of the groove is reached.

It will, of course, be understood that instead of employing the element 26 as a bridge piece to close circuit through two
 25 brushes upon the tone arm, it may itself be employed as a circuit terminal, such a modification being one which would be obvious to anyone familiar with electrical appliances, and in Fig. 5 I have shown a modification
 30 in which such a terminal 23 is employed, the same being connected by a wire 24 with a metallic sleeve 25 which is in electrical connection with the shaft 10, the said shaft being connected by a wire 22 with the tripping
 35 device 17. A wire 21 connects the generator 33 with the tripping device, and a wire 20 connects the opposite side of the generator 33 with a binding post in electric connection with the tone arm.

40 In Fig. 4 I have shown a cylindrical form of record 30 which is provided with a contact terminal 31 at the termination of the sound groove 32 thereof. It is obvious that my invention is equally applicable to either
 45 the disk or cylindrical form of sound reproducing means.

What I claim is:

1. In a sound reproducing machine, the combination with a record carrier and a
 50 record carried thereby, the said record being provided with a sound groove having a deeper portion at the termination thereof, of a reproducer provided with a stylus and a traveling arm therefor, circuit closing
 55 means including a member carried by the said reproducer and traveling arm and held normally out of contact with the face of the record while the stylus is traveling along the greater portion of the said sound groove

but being allowed to engage the face of the
 60 said record when the stylus reaches the deeper portion of the said sound groove, and an electric stopping means, the circuit for which is arranged to be controlled by the engagement of the said contact member
 65 with the face of the said record.

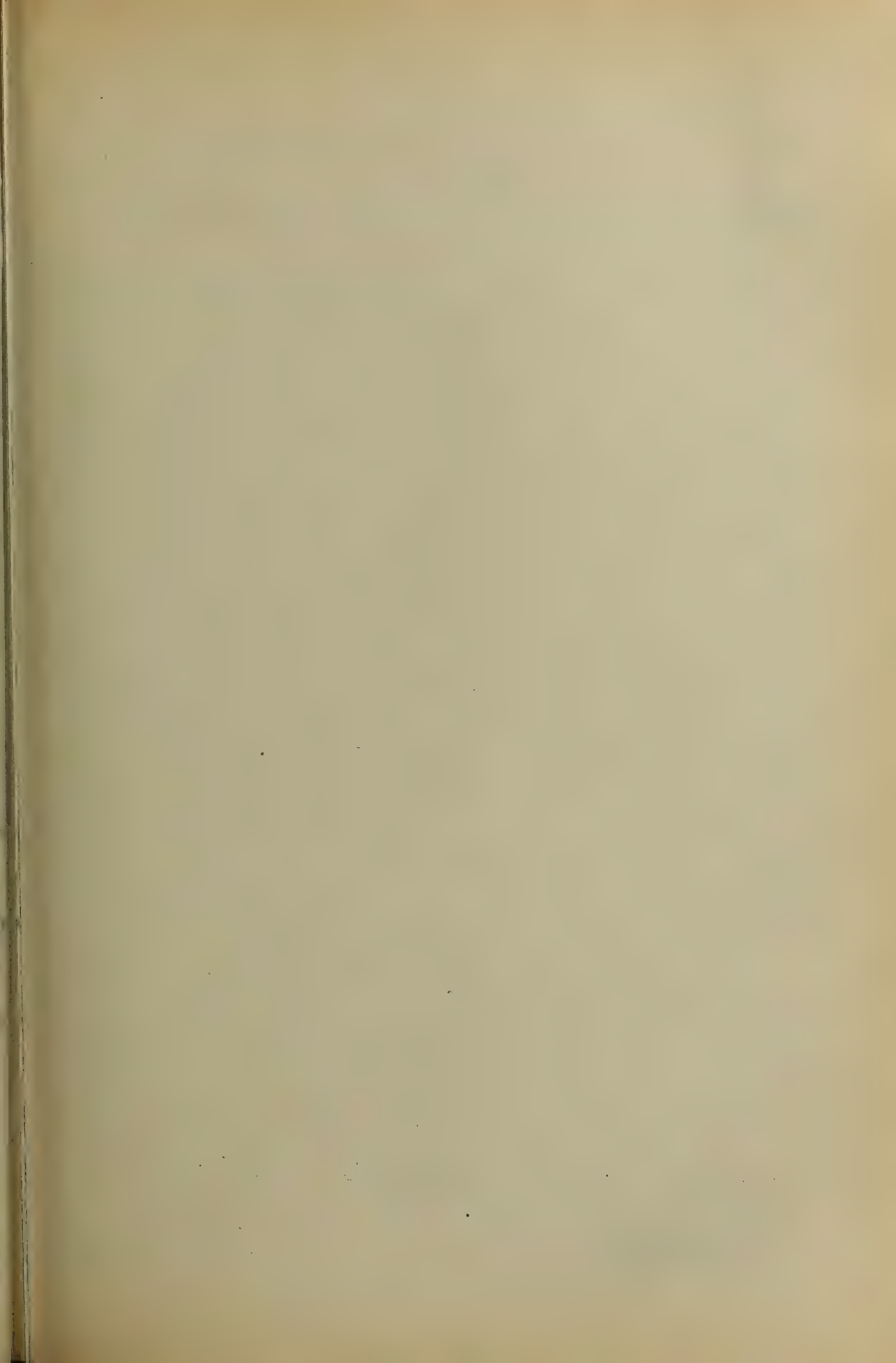
2. In a sound reproducing machine, the combination with a rotatable record carrier and a record carried thereby, the said record being provided with a sound groove having
 70 a deeper portion at the termination thereof and provided with a circuit closing element in proximity thereto, the face of the said circuit closing element being substantially flush with the face of the said record, of a
 75 reproducer provided with a stylus and a traveling arm therefor, a circuit closing element carried by the said reproducer and traveling arm, the said circuit closing element being normally out of contact with the
 80 face of the said record but arranged to be lowered to engage the circuit closing element carried by the record when the stylus reaches the deeper portion of the groove, and an electric stopping device the circuit
 85 for which is arranged to be closed by the co-engagement of the two said circuit closing elements.

3. In a sound reproducing machine, the combination with a rotatable record carrier
 90 and a record carried thereby, the said record being provided with a sound groove having a deeper portion at the termination thereof and having a metallic plate located in proximity thereto, the face thereof being sub-
 95 stantially flush with the face of the said record, of a reproducer provided with a stylus and a traveling arm therefor, two contact elements carried by the said reproducer and traveling arm, the said ele-
 100 ments being normally insulated from each other and held out of contact with the face of the said record during the time the stylus is traveling through the greater portion of the said sound groove, the said elements
 105 being arranged to be lowered to the level of the face of the record and to be engaged by the metallic plate carried by the said record when the said stylus reaches the deeper portion of the sound groove, and an electric
 110 stopping device, the circuit for which is arranged to be closed by the engagement of the two said contact elements with the said metallic plate.

FREDERICK H. OSBORN.

Witnesses:

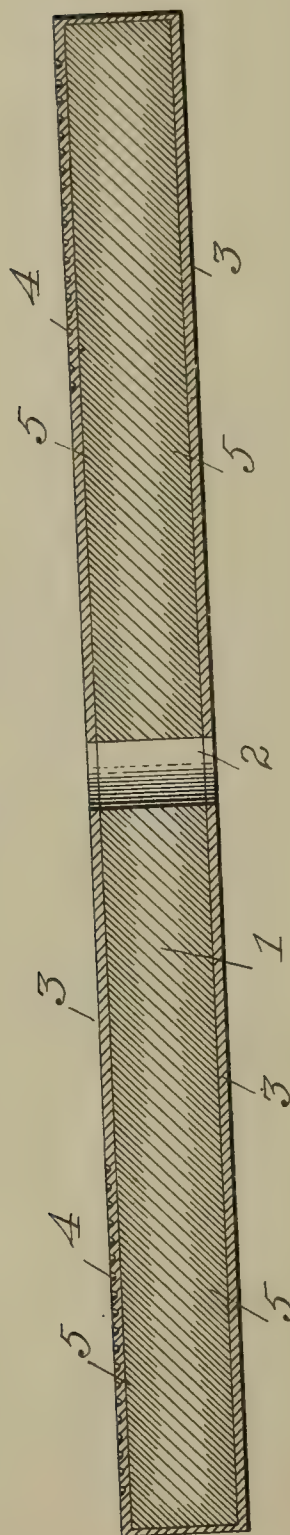
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SOUND RECORD TABLET.
APPLICATION FILED APR. 20, 1904.

Patented May 3, 1910.

956,904.



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UNITED STATES PATENT OFFICE.

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SOUND-RECORD TABLET.

956,904.

Specification of Letters Patent.

Patented May 3, 1910.

Application filed April 20, 1904. Serial No. 204,024.

To all whom it may concern:

Be it known that I, JOSEPH SANDERS, a citizen of the United States, and resident of Washington, in the District of Columbia, have invented certain new and useful Improvements in Sound-Record Tablets, of which the following is a specification.

My invention has reference to improvements in sound record tablets, particularly flat sound record tablets, such as are employed in the commercial gramophone, although the invention is also applicable for use in phonographs and graphophones.

The gramophone tablet which is used commercially, consists of a flat disk of hard rubber or of an imitation of hard rubber, having a sound record impressed on one or both surfaces in the shape of a spiral groove of even depth, the groove itself being laterally undulating, and these lateral undulations or sinuosities correspond to the recorded sound waves, which are reproduced from the tablet by causing the sinuosities to react upon a style and diaphragm, as is well known to those skilled in the art.

In a phonograph or graphophone record the groove is not of uniform depth, but of varying depth, and the variations of depth in that case correspond to the recorded sound waves, which are then reproduced from the tablet by causing these vertical undulations to react upon a style and diaphragm in the manner well known to those skilled in the art.

The material of the flat gramophone record tablets is now almost universally a composition of matter in which shellac is combined with infusorial earth or with baryta, or other like substances. The shellac serves as a binder for the powdery body of baryta or infusorial earth, and the mixture forms a mass, which, like hard rubber, is softened by heat, but is very hard when cold. The sound record is impressed upon such tablets by a metallic matrix on which the undulations corresponding to sound waves appear in raised lines. A lump or mass of the record material, heated until it is quite soft or in a doughy condition, is placed upon the matrix and is pressed out into a disk, in intimate contact with the matrix, by the application of considerable force and this tablet of record material is kept in contact with the matrix until cool and hard. In order to serve its purpose the record material must be of such character that it be-

comes soft and plastic when heated, so that it will then receive the impress of a matrix, and when cold it must be so hard that it will then not receive an impression from a matrix, will not elastically yield to and will not perceptibly wear under the action of a gramophone reproducing style; only to such materials do I apply the term gramophone "record material." In this process it is necessary that a considerable thickness or mass of the tablet material be used in order that the body of it form a yielding cushion for the impressed surface at the time when the pressure is exerted upon it by the matrix. The impression obtained, that is to say, the spiral groove, is, under all circumstances, very shallow, rarely exceeding a depth of $\frac{1}{300}$ of an inch, so that it would seem to be sufficient to heat and soften the tablet only at its upper surface and leave the remainder quite hard. Experience, however, has shown that such practice will not yield a good impression and that it is necessary that the record material be yielding to a considerable depth and preferably throughout its whole mass in order that good impressions from the matrix be obtained. This is one of the reasons why the record tablets are made of considerable thickness. Another reason for this practice is that the resinous tablet is rather brittle, so that when dropped upon a hard table or upon a hard floor it will crack and break if made as thin as it might otherwise be made. The material employed, however, particularly the shellac, is quite expensive, and for this reason strength is frequently sacrificed to cheapness.

It is the object of my invention to produce a record tablet that contains only a minimum of resinous or similar record material, but which nevertheless yields under the pressure of the matrix to a considerable depth, and which is also very much stronger than the record tablets made altogether of the resinous compounds usually employed.

In the accompanying drawing I show a cross section of a record tablet made in accordance with my invention.

In this drawing 1 represents a disk of card board, or other stiff, tough, fibrous material. This is made of the size usually given to gramophone tablets; it has a hole 2 at the center for mounting on a turn-table when sound reproduction is desired. This disk is coated with a thin layer 3 of the

resinous record material, adapted to receive, when heated, the impression of a sound record matrix; such impression is indicated at 1. Since it is desirable to use no more of this material than is necessary, I preferably apply to the card board or other fibrous base, first a sizing of rosin which will sink into the surface of the card board for a distance, or may permeate the card board throughout, or any other kind of sizing that softens under heat, that well adheres to or sinks to a certain distance into the card board and to which the superimposed layer of record material also well adheres, may be used. This sizing, by closing the pores of the surface of the card board, prevents the absorption by the body of the card board of the superimposed layer of record material, and when the sizing permeates the card board it acts as a binder for the fibers causing the tablet to retain its shape after pressing and making it more solid and compact, for, without the binding action of the sizing of the card board fibers would tend to return to their original shape when the pressure is relieved.

When rosin, which I prefer as a sizing, is employed, I dissolve it in benzol, alcohol or other like solvent, and either dip the tablet into the solution and then withdraw it and allow the solvent to evaporate, or this sizing can be applied by a brush.

Upon the sized paste board or other fibrous disk the record material may be applied in any desired manner, but in order that the record material form a uniform and at the same time thin layer, I have found that it is best that it be applied in a fluid state. For this purpose the record material may be dissolved in a suitable solvent and the sized disk dipped into that mass or painted with the same, so that after the evaporation of the solvent there remains upon the surface of the disk a thin layer of the record material. I have found that the layer of record material need not be thicker, but may be thinner than $\frac{1}{100}$ of an inch; it is thus a mere film.

The record material which is particularly adapted for the production of my improved sound record tablet consists of shellac as a binder and of an oxid of a metal, preferably the natural oxid of iron as the powdery body. To prepare this material for application to the tablet, I dissolve the shellac in alcohol and mix into this solution the requisite quantity of metal oxid, so that the whole mass forms a rather thin paint or emulsion. I have found the proportion of two parts of shellac to three parts of iron oxid, gives good results.

This mode of preparing the record material by dissolving the shellac or other rosin, or gum, or other binder, and then mixing the oxid of iron or other proper substance

into it, gives an exceedingly intimate and uniform mixture, such as cannot be obtained by stirring the powdery body into the molten mass of the binder. Another important advantage results from this process of making the record material is that it avoids the necessity of fusing the shellac or other binder and thus the danger of deteriorating the same by the high temperature to which it must be subjected. The paint thus obtained is applied to the sized fibrous disk either by a brush, as in ordinary painting, or the disk is immersed in the paint. The alcohol evaporates readily and there is then upon the disk a hard thin film of record material. A sound record is impressed upon this disk, upon one or both surfaces, by heating the disk until the record material becomes plastic, and then pressing onto it a suitably prepared matrix of a sound record, and holding it in contact with the disk until the latter has cooled and the record material has become quite hard.

The record tablet constituted as above described is very much tougher and stronger than record tablets entirely composed of record material, and it receives and retains the impress of a matrix fully as well as if it were entirely composed of record material, since the card board or other fibrous base, particularly when impregnated throughout with sizing, yields under the pressure of the matrix sufficiently for the purpose. At the same time my improved tablet is very much cheaper than tablets which are made entirely of record material such as the shellac mixture now used.

The sizing described, because it is hard and resisting when cold and softens under the action of the degree of heat usually employed in the manufacture of sound record duplicates from a matrix of a sound record may be termed "thermoplastic", which term is also applicable to the specific sound record material hereinbefore described as well as to other sound record materials of the gramophone class.

When the tablet blank is subjected to the heat and pressure usually employed the plasticity of the sizing permits some displacement of the fibers of the base from their initial relations and furthermore there will be some flowing of the sizing when softened by heat and the structure is subjected to pressure. The softened sizing appears to serve as a lubricant for the fibers of the body material of the base permitting and facilitating the movement of the fibers one upon another to an extent sufficient to cause the base to readily conform to the grosser irregularities in the active faces of the matrix or die or both when a sound record duplicate is being pressed, and to also conform to any lack of true parallelism between the matrix and die or where the pressing

surfaces are not true planes. Because of this automatic adjustment of the base to the matrix and die as the sound record groove is being impressed into the record material on the surface of the tablet, the active face of the matrix is brought into intimate contact with the record material at all points and a perfect impression results.

When the sized base has been cooled to ordinary temperatures before the pressure is relieved, the sizing hardens and sets and anchors the fibers against their normal or inherent tendency to return or spring back when relieved from pressure. It follows, therefore, that the base of the tablet, is itself thermoplastic.

When a tablet is formed wholly of gramophone material in which case they may be termed "homogeneous" tablets to distinguish them from the composite tablets of the present invention, and especially with homogeneous tablets formed of the shellac mixtures now in common use, there is a mass flow of the material which is not only wearing on the active face of the matrix, but the dies are liable to dish because, in the manufacture of homogeneous tablets of shellac mixtures, it is customary to apply the material in the form of a heated lump or mass to the middle portion of the matrix and to then force the hot plastic material outward to the edges of the matrix.

With a tablet constructed in accordance with the present invention the pressure is very evenly distributed at all times over the entire active surfaces of the matrix and die since the tablet blank, that is, the tablet before the sound record groove is impressed therein, is nearly or quite coextensive with the matrix. Consequently there is no liability of dishing the die and for this reason the die may be made much thinner and the heating and cooling is expedited and handling is facilitated.

The normal characteristics of the fibrous material of the base of the tablet, in so far as this fibrous material resists any marked changes in shape under the pressure employed, predominate in the sized and coated tablet blank, and while the sizing imparts thermoplasticity to the base of the tablet, such thermoplasticity is not sufficient to cause the base to lose its shape when heated or to then flow under pressure except to the very limited extent necessary to cause it to conform to irregularities in or want of parallelism between the matrix and die or of tablet blank with either of them. What adjustment of the base of the tablet blank to the matrix or die or both of them may occur while the impressing of the sound record groove is progressing is so limited in extent that there is no danger of rupturing or otherwise injuring the thin film of record material on the surface of the tablet blank.

Furthermore, the record material of the film while flowing sufficiently to insure a perfect conformity to the matrix under the action of heat and pressure, does not flow to any such extent or cause such wear on the matrix as occurs when the tablets are made of homogeneous material.

While the improved tablet or tablet blank is lighter and far less frangible than the homogeneous tablets due to predominant characteristics of the fibrous body material, and can also be more cheaply and expeditiously produced than can the homogeneous tablets, the brilliancy of reproduction from sound record grooves impressed in the improved or composite tablets is fully equal to that from homogeneous tablets. This is due to the hardness imparted to the base of the tablet, by the sizing, the composite tablet with the sound groove impressed therein being comparable to homogeneous tablets of the shellac compositions in resonant qualities.

The thermoplastic material of the base portion of the tablet imparts such characteristics to the base that the bending and expansion coefficients of the base and surfacing of record material are so nearly alike as to prevent cracking of the surface film of record material, and warping of the tablet.

While it is practicable to coat only one surface of the fibrous disk with the record material, I have found it preferable to coat the disk on both sides and on the edges in order to prevent warping; and this I do whether a sound record is impressed only on one side or both.

While I have found the record material composed of shellac and metallic oxid to be the best for the purpose of my invention, I am by no means confined to the use of these materials. Other compounds may be used although not with like advantage.

I do not herein claim the process of making the record tablets, since such process is claimed in another application, Serial No. 252,840, filed by me on March 30, 1905, as a division of this case.

Having now fully described my invention I claim and desire to secure by Letters Patent:

1. A sound record tablet consisting of a base of stiff fibrous material, with a sizing which softens when heated applied to its surface, and a layer of gramophone record material upon the sizing, substantially as described.

2. A sound record tablet consisting of a stiff fibrous base, with a sizing that softens when heated applied to its surface, and a layer of gramophone record material superimposed thereon and a sound record groove impressed therein, substantially as described.

3. A sound record tablet consisting of a

disk of cardboard, having its surface sized with rosin, and a layer of gramophone record material applied thereto, substantially as described.

5 4. A sound record tablet consisting of a disk of cardboard, with a sizing of rosin applied to its surface, a layer of gramophone record material superimposed thereon, and a sound record groove impressed into the
10 record material, substantially as described.

5. As a new article of manufacture, a normally flat record blank of sufficient rigidity to substantially maintain its normal shape in ordinary handling, said blank having a homogeneous core or center made up of
15 a porous body of fibrous material and a bond of size permeating said body, a surface coating of size on said body and a surface of plastic gramophone material on the coating of size, said plastic material being
20 adapted to receive and retain impressions, substantially as described.

6. A sound record tablet consisting of a base of stiff fibrous material with a sizing that softens when heated applied to its surface, and a layer of suitable record material upon the sizing, substantially as described.
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7. A sound record tablet consisting of a stiff fibrous base, with a sizing that softens when heated applied to its surface, and a layer of suitable record material superimposed thereon and a sound record groove impressed therein, substantially as described.
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8. A sound record disk tablet consisting of a base of fibrous material having resinous material upon its surface and in its body and a surface of suitable record material applied to said base.
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9. A sound-record tablet consisting of a base of stiff fibrous material with a sizing that softens when heated applied to its surface, and a layer of disk record material upon the sizing, substantially as described.
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10. A sound-record tablet consisting of a stiff fibrous base, with a sizing that softens when heated applied to its surface, and a layer of disk record-material superimposed thereon and a sound record groove impressed therein, substantially as described.
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11. A sound-record disk tablet consisting of a base of fibrous material having resinous material upon its surface and in its body and a surface of disk record-material applied to said base.
50

12. A sound-record tablet consisting of a base of stiff fibrous material with a sizing applied to its surface, and a layer of disk record-material upon the sizing, substantially as described.
55

13. A sound-record tablet consisting of a stiff fibrous base, with a sizing applied to its surface, and a layer of disk record-material superimposed thereon, and a sound-record groove impressed therein, substantially as described.
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14. A sound record tablet consisting of a base of fibrous material of sufficient stiffness to maintain its shape, a sizing applied to its surface, and a surface of record material sufficiently hard to practically resist
70 the action of a pointed stylus and applied to said sized base.

15. A sound record tablet consisting of a fibrous base, stiffening material rendering the base plastic under the action of heat
75 and pressure and capable, when cold, of rigidly maintaining the form imparted to it under the action of heat and pressure, and a surface coating of gramophone record material.
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16. A sound record tablet composed of a formed fibrous base, a thermo-plastic material incorporated in said base, said material being of a character unsuited for the reproduction of gramophone sound record
85 impressions therein, and a surface coating of gramophone record material.

17. A sound record tablet blank comprising a fibrous structure, a layer of resinous record receiving material thereon, and a
90 thermoplastic material stiffening the fibrous structure to resist bending under normal conditions of use to an extent to cause the cracking of the surface layer of record material.
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18. A sound record tablet blank comprising a fibrous structure, a layer of record receiving material thereon containing shellac, and a thermoplastic material stiffening the fibrous structure to resist bending under normal
100 conditions of use to an extent to cause the cracking of the surface layer of record material.

19. A sound record tablet blank comprising a fibrous structure, a layer of resinous
105 record receiving material thereon, and a thermoplastic material applied to the fibrous structure and imparting stiffness and rigidity to the tablet blank.

20. A sound record tablet comprising a
110 fibrous structure, a layer of resinous record receiving material thereon having a record groove impressed therein, and a thermoplastic material applied to the fibrous structure and imparting stiffness and rigidity to
115 the tablet.

21. A sound record tablet comprising a fibrous structure, a layer of record receiving material thereon containing shellac and having a sound record groove impressed therein,
120 and a thermoplastic material applied to the fibrous structure and imparting stiffness and rigidity to the said tablet.

22. A sound record tablet blank comprising a fibrous structure, a layer of resinous
125 record receiving material thereon, and a thermoplastic material unsuited for the reproduction of sound from a sound record groove impressed therein, said thermoplastic material being applied to the fibrous struc-
130

ture and imparting stiffness and rigidity to the tablet blank.

23. A sound record tablet blank comprising a fibrous structure, a layer of gramophone record receiving material thereon and containing shellac, and a thermoplastic material unsuited for the reproduction of sound from a gramophone sound record impressed therein, said thermoplastic material being applied to the fibrous structure and imparting stiffness and rigidity to the tablet blank.

24. A sound record tablet comprising a fibrous structure, a layer of record receiving material thereon containing shellac and having a sound record groove impressed therein, and a thermoplastic material unsuited for the reproduction of sound from a gramophone sound record impressed therein, said thermoplastic material being applied to the fibrous structure and imparting stiffness and rigidity to the tablet.

25. A tablet adapted for sound record duplicates having a surface layer of gramophone record material containing shellac and a base or under-structure including thermoplastic material and means resistant to the spreading of the surface layer of gramophone material under the action of heat and pressure incident to impressing a sound record groove into said surface layer from a matrix thereof.

26. A disk-shaped sound record tablet having a surface layer of gramophone record material containing shellac and having a sound record groove impressed therein, and a base or under-structure including thermoplastic material and means resistant to the spreading of the surface layer of gramophone material under the action of heat and pressure incident to impressing a sound record groove therein from a matrix thereof.

27. A sound record tablet blank comprising a base or under-structure of fiber and thermoplastic material with the fiber predominating and the thermoplastic material rendering the base yieldable under heat and pressure and when cold resistant to distorting forces, and a surface coating of thermoplastic material capable when heated of receiving the impress of a record matrix and when cold of retaining such impress and then resistant to the action of the stylus of a sound reproducing machine of the gramophone type.

28. A sound record tablet comprising a base or under-structure of fiber and thermoplastic material with the fiber predominating and the thermoplastic material rendering the base yieldable under heat and pressure and when cold resistant to distorting forces, and a surface coating of thermoplastic material capable when heated of receiving the impress of a sound matrix and when cold of retaining such impress and then resistant to the action of a stylus of a sound

reproducing machine of the gramophone type, the surface coating having a sound record groove impressed therein.

29. A sound record tablet blank comprising a base or under-structure of fiber and thermoplastic material with the fiber predominating and the thermoplastic material rendering the base yieldable under heat and pressure and when cold resistant to distorting forces, and a surface coating of thermoplastic material containing shellac and capable when heated of receiving the impress of a sound record matrix and when cold of retaining such impress and then resistant to the action of the stylus of a sound reproducing machine of the gramophone type.

30. A sound record tablet comprising a thermoplastic disk-shaped base or under-structure and a surface coating of gramophone or disk record material with a sound record groove impressed therein, both base and surface material yielding under the action of heat and pressure for the impress of a sound record groove in the surface layer, and the base when cold retaining the shape imparted to it under heat and pressure and also being resistant to distorting forces, the thermoplasticity of the base or under-structure being due to a different material from that of the record receiving material but of substantially the same bending coefficient.

31. A sound record tablet blank comprising a fibrous base or under-structure yieldable under the action of heat and pressure, and a surfacing of gramophone or disk record material, the base or under-structure and the surfacing possessing different degrees of thermoplasticity.

32. A sound record tablet blank comprising a thermoplastic base or under-structure and a surfacing of gramophone or disk record material, the base or under-structure being thermoplastic to a less degree than the surfacing material.

33. A sound record tablet comprising a thermoplastic base or under-structure and a surfacing of gramophone or disk record material with a sound record groove impressed therein, the base or under-structure being thermoplastic to a less degree than the surfacing material.

34. A sound record tablet blank comprising a formed fibrous base or under-structure impregnated with a thermoplastic material rendering the base when cold hard and resisting to distorting forces, and a surfacing of gramophone or disk record material.

35. A sound record tablet comprising a formed fibrous base or under-structure impregnated with a thermoplastic material rendering the base when cold hard and resisting to distorting forces, and a surfacing of gramophone or disk record material having a record groove impressed therein.

36. A sound record tablet blank compris-

ing a formed fibrous base or under-structure impregnated with thermoplastic material rendering the base when cold hard and resisting to distorting forces, and a surfacing of gramophone or disk record material containing shellac.

37. A sound record tablet blank having a thermoplastic surface resistant to the wear of the stylus of a gramophone or disk type of sound reproducing machine, and a non-frangible base or under-structure containing a characteristically predominant mass of substantially non-thermoplastic material and sufficient thermoplastic material to render the base or under-structure yieldable to the action of heat and pressure and when cold resistant to distorting forces.

38. A sound record tablet blank having a thermoplastic surface containing shellac and resistant to the wear of a stylus of the gramophone or disk type of sound reproducing machine, and a non-frangible base or under-structure comprising a normally porous material containing sufficient thermoplastic material to render the base or under-structure compactible when heated and subjected to pressure and when cold resistant to distorting forces.

39. A sound record tablet having a base of a normally absorbent material with its interstices infiltrated with thermoplastic material rendering the base yieldable under the action of heat and pressure, and a surfacing of gramophone or disk record material.

40. A sound record tablet comprising a disk of tenacious fibrous material infiltrated with a thermoplastic material rendering the disk yieldable under the action of the heat and pressure used for impressing the record groove from a sound record matrix and when cold maintaining the disk in the shape imparted to it under the action of the heat and pressure employed against the action of distorting forces, and a surface layer of gramophone or disk record material.

41. A sound record tablet comprising a disk of tenacious fibrous material infiltrated with thermoplastic material rendering the disk yieldable under the action of heat and pressure and when cold maintaining the disk in the shape imparted to it under heat and pressure and against the action of distorting forces, and a surface layer of gramophone or disk record material containing shellac.

42. A sound record tablet having a surface layer of material adapted for the reception of a sound record groove and the reproduction of the sound therefrom, and a base or under-structure comprising a continuous or unbroken body of fiber and a material rendering the base or under-structure resonant.

43. A sound record tablet having a surface layer of gramophone record material containing shellac, and a base or under struc-

ture comprising a continuous or unbroken body of fiber and a material imparting to the base or under-structure resonant qualities similar to those of the surface layer.

44. A sound record tablet having a surface layer of gramophone record material containing shellac, and a base or under-structure comprising a continuous or unbroken body of fiber and a thermoplastic material imparting to the base or under-structure resonant qualities similar to those of the surface layer.

45. A sound record tablet having a base or under-structure composed of a disk of fibrous material and a material applied thereto and imparting resonant qualities to the base or under-structure, and a surface layer of a material adapted for the reproduction of sound from a sound record groove formed therein.

46. A sound record tablet having a base or under-structure composed of a disk of fibrous material and a material applied thereto and imparting resonant qualities to the said base or under-structure, and a surface layer of resonant gramophone material.

47. A sound record tablet having a base or under-structure composed of a disk of fibrous material and a material applied thereto and imparting resonant qualities to the said base or under structure, and a surface layer of gramophone material containing shellac.

48. A sound record tablet having a base or under structure composed of a disk of fibrous material infiltrated with a material imparting resonant qualities to said base or under-structure, and a surface layer of a material adapted for the reproduction of sound from a sound record groove formed therein.

49. A sound record tablet having a base or under-structure composed of a disk of fibrous material and a material applied thereto and imparting resonant qualities to the base or under-structure, and a surface layer of resonant material adapted for the reproduction of sound from a sound record groove formed therein and containing a sound record groove.

50. A sound record tablet having a base or under-structure composed of a disk of fibrous material and a material applied thereto and imparting resonant qualities to the said base or under structure, and a surface layer of resinous material adapted for the reproduction of sound from a sound record groove formed therein and containing a sound record groove.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH SANDERS.

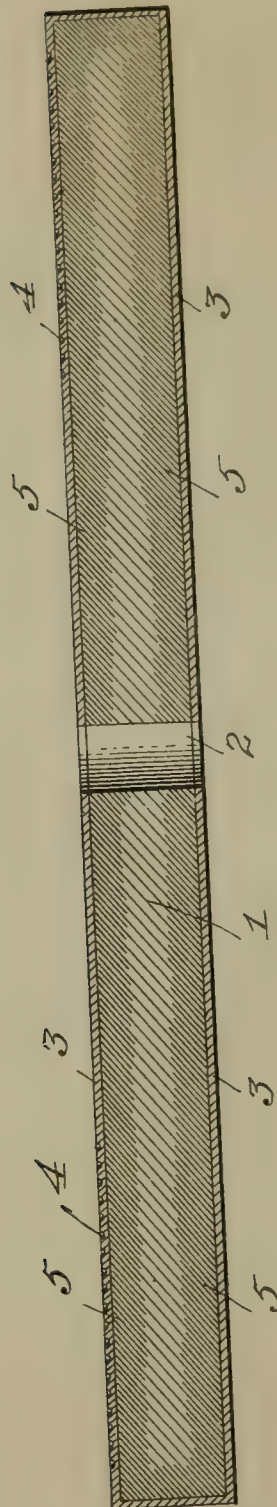
Witnesses:

CHARLES JACKSON,
LEO P. NACHMAN.

J. SANDERS.
PROCESS OF MAKING SOUND RECORD TABLETS.
APPLICATION FILED MAR. 30, 1905.

Patented May 3, 1910.

956,905.



Witnesses:
Edwin L. Yewell.
H. J. Chapman.

By

Lyons & Bissong.

Attorneys.

UNITED STATES PATENT OFFICE.

JOSEPH SANDERS, OF WASHINGTON, DISTRICT OF COLUMBIA.

PROCESS OF MAKING SOUND-RECORD TABLETS.

956,905.

Specification of Letters Patent.

Patented May 3, 1910.

Original application filed April 20, 1904, Serial No. 204,024. Divided and this application filed March 30, 1905. Serial No. 252,840.

To all whom it may concern:

Be it known that I, JOSEPH SANDERS, a citizen of the United States, and resident of Washington, in the District of Columbia, have invented certain new and useful Improvements in Processes of Making Sound-Record Tablets, of which the following is a specification.

My invention has reference to improvements in the process of making sound record tablets particularly flat sound record tablets, such as are employed in the commercial gramophone, although the invention is also applicable for use in phonographs and graphophones.

The gramophone tablet which is used commercially, consists of a flat disk of hard rubber or of an imitation of hard rubber, having a sound record impressed on one or both surfaces in the shape of a spiral groove of even depth, the groove itself being laterally undulating, and these lateral undulations or sinuosities correspond to the recorded sound waves, which are reproduced from the tablet by causing the sinuosities to react upon a style and diaphragm, as is well known to those skilled in the art.

In a phonograph or graphophone record the groove is not of uniform depth, but of varying depth, and the variations of depth in that case correspond to the recorded sound waves, which are then reproduced from the tablet by causing these vertical undulations to react upon a style and diaphragm in the manner well known to those skilled in the art.

The material of the flat gramophone record tablets is now almost universally a composition of matter in which shellac is combined with infusorial earth or with baryta, or other like substances. The shellac serves as a binder for the powdery body of baryta or infusorial earth, and the mixture forms a mass, which, like hard rubber, is softened by heat, but is very hard when cold. The sound record is impressed upon such tablets by a metallic matrix on which the undulations corresponding to sound waves appear in raised lines. A lump or mass of the record material, which is thermoplastic, is heated until it is quite soft or in a doughy

condition, and then is placed upon the matrix and is pressed out into a disk, in intimate contact with the matrix, by the application of considerable force and this tablet of record material is kept in contact with the matrix until cool and hard. In order to serve its purpose the record material must, when cold, be so hard, that it will then not receive an impression from a matrix, will not elastically yield to and will not perceptibly wear under the action of a gramophone reproducing style; only to such materials do I apply the term "gramophone record material." In this process it is necessary that a considerable thickness or mass of the tablet material be used in order that the body of it form a yielding cushion for the impressed surface at the time when the pressure is exerted upon it by the matrix. The impression obtained, that is to say, the spiral groove, is, under all circumstances, very shallow, rarely exceeding a depth of $1/300$ of an inch, so that it would seem to be sufficient to heat and soften the tablet only at its upper surface and leave the remainder quite hard. Experience, however, has shown that such practice will not yield a good impression and that it is necessary that the record material be yielding to a considerable depth and preferably throughout its whole mass in order that good impressions from the matrix be obtained. This is one of the reasons why the record tablets are made of considerable thickness. Another reason for this practice is that the resinous tablet is rather brittle, so that when dropped upon a hard table or upon a hard floor it will crack and break if made as thin as it might otherwise be made. The material employed, however, particularly the shellac, is quite expensive, and for this reason strength is frequently sacrificed to cheapness.

It is the object of my invention to produce a record tablet that contains only a minimum of resinous or similar record material, but which nevertheless yields under the pressure of the matrix to a considerable depth, and which is also very much stronger than the record tablets made altogether of the resinous compounds usually employed.

In the accompanying drawing I show a

cross section of a record tablet made in accordance with my invention.

In this drawing 1 represents a disk of card board, or other stiff, tough, fibrous material. This is made of the size usually given to gramophone tablets; it has a hole 2 at the center for mounting on a turn-table when sound reproduction is desired. This disk is coated with a thin layer 3 of the resinous record material, adapted to receive, when heated, the impression of a sound record matrix; such impression is indicated at 4. Since it is desirable to use no more of this material than is necessary, I preferably apply to the card board or other fibrous base, first a sizing 5 of rosin which will sink into the surface of the card board for a distance or may permeate the card board throughout, or any other kind of sizing that softens under heat, that is, it is thermoplastic, that well adheres to or sinks to a certain distance into the card board and to which the superimposed layer of record material also well adheres, may be used. This sizing, by closing the pores of the surface of the card board, prevents the absorption by the body of the card board of the superimposed layer of record material, and when the sizing permeates the card board it acts as a binder for the fibers, causing the tablet to retain its shape after pressing and making it more solid and compact, for, without the binding action of the sizing the card board fibers would tend to return to their original shape when the pressure is relieved.

When rosin, which I prefer as a sizing, is employed, I dissolve it in benzol, alcohol or other like solvent, and either dip the tablet into the solution and then withdraw it and allow the solvent to evaporate, or this sizing can be applied by a brush.

Upon the sized paste board or other fibrous disk the record material may be applied in any desired manner, but in order that the record material form a uniform and at the same time thin layer, I have found that it is best that it be applied in a fluid state. For this purpose the record material may be dissolved in a suitable solvent and the sized disk dipped into that mass or painted with the same, so that after the evaporation of the solvent there remains upon the surface of the disk a thin layer of the record material. I have found that the layer of record material need not be thicker, but may be thinner than 1/100 of an inch; it is thus a mere film.

The record material which is particularly adapted for the production of my improved sound record tablet consists of shellac as a binder and of an oxid of a metal preferably the natural oxid of iron as the powdery body. To prepare this material for application to the tablet, I dissolve the shellac in

alcohol and mix into this solution the requisite quantity of metal oxid, so that the whole mass forms a rather thin paint or emulsion. I have found the proportion of two parts of shellac to three parts of iron oxid, gives good results. This mode of preparing the record material by dissolving the shellac or other resin, or gum, or other binder, and then mixing the oxid of iron or other proper substance into it, gives an exceedingly intimate and uniform mixture, such as cannot be obtained by stirring the powdery body into the molten mass of the binder. Another important advantage results from this process of making the record material is that it avoids the necessity of fusing the shellac or other binder and thus the danger of deteriorating the same by the high temperature to which it must be subjected. The paint thus obtained is applied to the sized fibrous disk either by a brush, as in ordinary painting, or the disk is immersed in the paint. The alcohol evaporates readily and there is then upon the disk a hard thin film of record material. A sound record is impressed upon this disk, upon one or both surfaces, by heating the disk until the record material becomes plastic, and then pressing onto it a suitably prepared matrix of a sound record, and holding it in contact with the disk until the latter has cooled and the record material has become quite hard.

The record tablet constituted as above described is very much tougher and stronger than record tablets entirely composed of record material, and it receives and retains the impress of a matrix fully as well as if it were entirely composed of record material, since the card board or other fibrous base, particularly when impregnated throughout with sizing yields under the pressure of the matrix sufficiently for the purpose. At the same time my improved tablet is very much cheaper than tablets which are made entirely of record material such as the shellac mixture now used.

While it is practicable to coat only one surface of the fibrous disk with the record material, I have found it preferable to coat the disk on both sides and on the edges in order to prevent warping; and this I do whether a sound record is impressed only on one side or both.

While I have found the record material composed of shellac and metallic oxid to be the best for the purpose of my invention, I am by no means confined to the use of these materials. Other compounds may be used although not with like advantage.

I do not herein claim the improved tablet since it is claimed in my application Serial Number 204,024, filed April 20, 1904, of which this application is a division.

Having now fully described my inven-

tion I claim and desire to secure by Letters Patent:

1. The process of making sound record tablet blanks, which consists in impregnating an absorbent base with a material that softens under heat, and then producing upon such base a layer of gramophone record material.

2. The process of making sound record tablet blanks, which consists in impregnating a fibrous base with a material that softens under heat, and then producing upon such base a layer of gramophone record material.

3. The process of making sound record tablet blanks, which consists in impregnating a disk of fibrous material with thermoplastic material and then producing upon such disk a layer of gramophone record material.

4. The process of making sound record tablet blanks, which consists in producing a thermoplastic fibrous base and then covering the same with thermoplastic record material.

5. The process of making sound record tablet blanks, which consists in impregnating a fibrous base with thermoplastic material, and then producing upon such base a layer of gramophone record material containing shellac.

6. The process of making sound record tablet blanks, which consists in producing a thermoplastic base of sufficient rigidity when cold to resist distorting forces, and then producing upon such base a layer of gramophone record material containing shellac and a hardening material.

7. The process of making sound record tablets, which consists in producing a thermoplastic base with sufficient rigidity when cold to resist distorting forces, then producing upon such base a layer of gramophone record material containing shellac and a hardening agent and then heating the tablet and impressing a sound record groove therein.

8. The process of making sound record tablets, which consists in producing a fibrous base yieldable to the action of heat and pressure and capable of maintaining when cold the shape so imparted to it, and provided with a surface layer of gramophone record material, and then heating the same and impressing a sound record groove therein.

9. The process of making a gramophone record tablet blank which consists in sizing a fibrous base with a material which softens under heat, then covering such sized base with a film of gramophone record material, and then allowing the film to harden.

10. The process of making a gramophone record tablet blank which consists in first

sizing a fibrous base, then covering the sized base with a film of an emulsion of gramophone record material, and then allowing the film to solidify.

11. The process of making a gramophone record tablet which consists in sizing a fibrous base with a material which softens under heat, then covering the sized base with a film of fluid gramophone record material, then allowing the film to harden, then heating the film and base until both the film and sizing are softened, and then impressing a sound record groove into the heated and thereby softened film.

12. The process of making a gramophone record tablet which consists in first sizing a fibrous base with a material which softens under heat, then covering the sized base with a film of gramophone record material, then allowing the film to harden, then heating the film and sized base to soften both the film and sizing, then impressing a sound record groove into the heated and thereby softened film, and then cooling both the film and sizing while under pressure.

13. The method of making sound record tablets, which consists in producing a layer of gramophone material upon a basic structure of thermoplastic material and fibrous material, the latter being in disk form, and impressing a sound record groove into the layer of gramophone material while the said layer and the thermoplastic material of the base are both softened by heat.

14. The method of making sound record tablets, which consists in producing a layer of gramophone material containing shellac upon a basic structure of thermoplastic material and fibrous material, the latter being in disk form, and impressing a sound record groove into the layer of gramophone material while the said layer and the thermoplastic material of the base are both softened by heat.

15. The method of making disk-shaped sound record tablets, which consists in producing spaced layers of gramophone material separated by fibrous material in disk form and by thermoplastic material, and impressing a sound record groove into the gramophone material while the latter and the intermediate thermoplastic material are softened by heat.

16. The method of making disk-shaped sound record tablets which consists in producing spaced layers of gramophone material separated by fibrous material in disk form and by thermoplastic material, and impressing a sound record groove into both layers of gramophone material while the latter and the intermediate thermoplastic material are softened by heat.

17. The method of making disk-shaped sound record tablets which consists in pro-

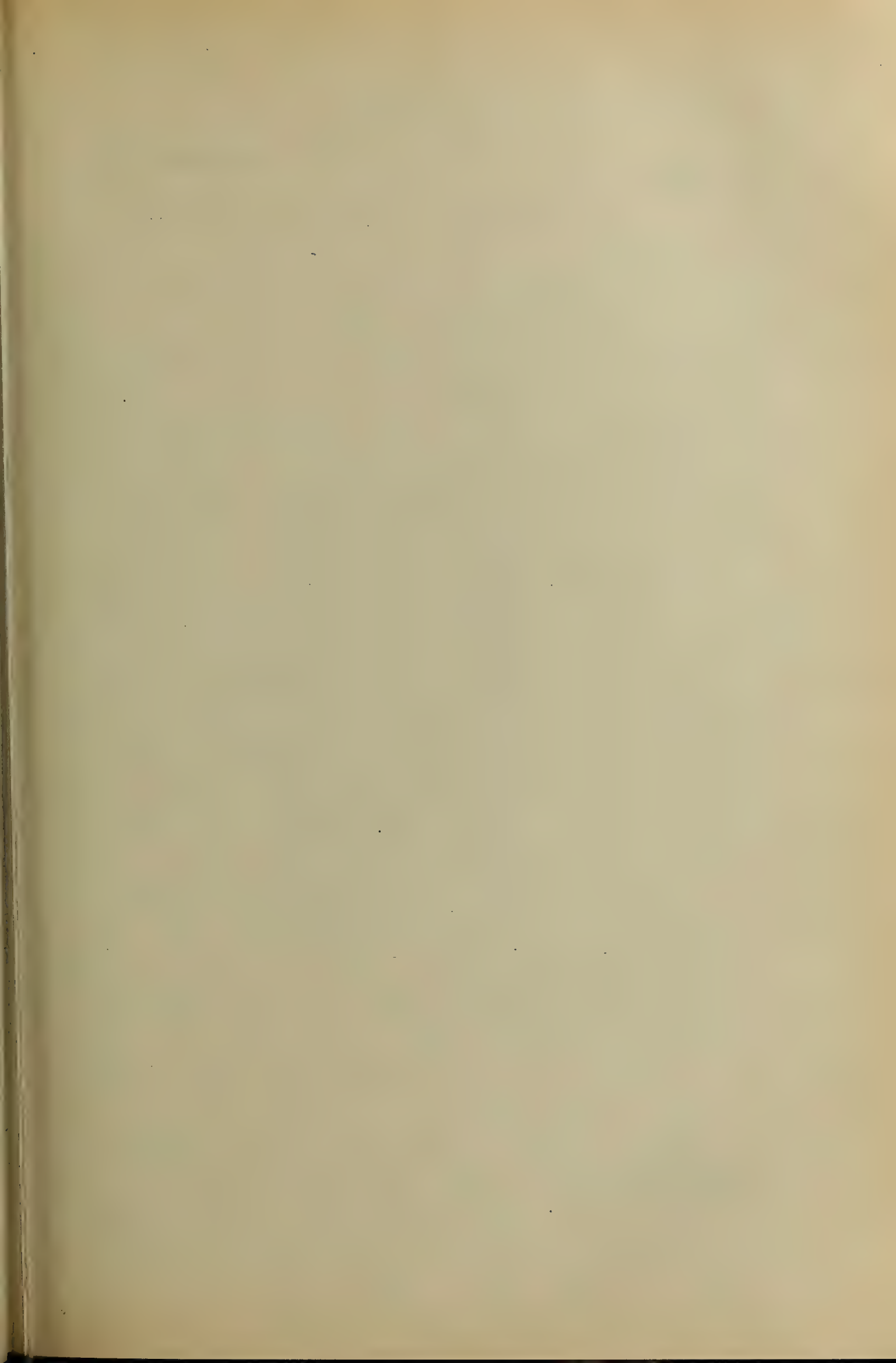
ducing spaced layers of gramophone material
containing shellac, separated by fibrous ma-
terial in disk form and by thermoplastic
material, and impressing sound record
5 grooves into both layers of gramophone ma-
terial while the latter and the intermediate
thermoplastic material are softened by heat.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

JOSEPH SANDERS.

Witnesses:

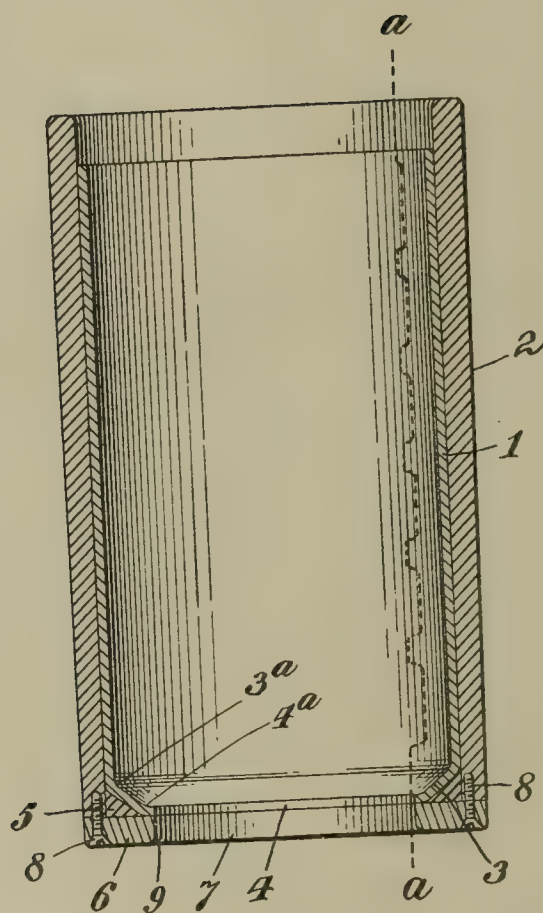
F. T. CHAPMAN,
EDWIN S. CLARKSON.



E. L. AIKEN.
PHONOGRAPH RECORD MOLD.
APPLICATION FILED OCT. 12, 1905.

Patented May 3, 1910.

956,922.



Attest:
Edgeworth Quinn
Delos Holden

Inventor:
Edward L. Aiken
by *Frank L. Aiken* Att'y.

UNITED STATES PATENT OFFICE.

EDWARD L. AIKEN, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH-RECORD MOLD.

956,922.

Specification of Letters Patent.

Patented May 3, 1910.

Application filed October 12, 1905. Serial No. 282,365.

To all whom it may concern:

Be it known that I, EDWARD L. AIKEN, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Record Molds, of which the following is a description.

My invention relates to the molding of phonograph records and more particularly to a molding process wherein a tubular mold is caused to descend into a bath of molten material which fills the mold, a coating of which congeals on the interior surface thereof and adheres to the same when the mold is removed from the bath, after which the bore of the congealed material is reamed out before it hardens.

In carrying out a process of this description it is very desirable that the mold be capable of forming the lower end of the record into a shape suitable for the finished article. This has however heretofore been impossible, as the wax congeals as soon as it encounters the mold and there is a great tendency for air bubbles to be entrapped between the surface of the mold and the wax, so that the practice heretofore has always been to form a rough end and remove the same by a cutter after the material has hardened.

My invention has for its object the provision of a mold which shall be capable of molding the lower end of a record into finished form; which will be strong mechanically in order that it may not be injured by rough handling extending over a long period of time; and more particularly that the interior or bore of the mold should be protected against injury by the reaming knife or by handling.

With these ends in view my invention consists in the features hereinafter described and claimed.

Reference is hereby made to the accompanying drawing which shows in longitudinal section a mold constructed in accordance with my invention.

The mold comprises a hollow cylinder 1 which carries upon its bore a negative representation of a sound record. This may be obtained in any well known manner as for instance by depositing upon a master record a metallic coating, as described in U. S. Patent No. 713,863 to Thomas A. Edison, and

afterward electro-plating upon said coating a shell of any suitable metal such as copper. This shell may be strengthened and protected by shrinking upon the same a brass cylinder 2. The upper end of this cylinder projects beyond the shell 1 thereby protecting the same. The lower end of the shell 1 extends inward and downward as shown, whereby a conical or beveled surface 3 is formed terminating in a central aperture 4. This surface 3 merges into the vertical portion of the shell 1 by a gentle curve 3^a and reaches the opening 4 by a similar curve 4^a extending toward the horizontal, so that the lower end of the molded article will be rounded off by reason of the curve 4^a, and the molten wax as it slowly enters the mold through the opening 4 will drive the air before it and will not entrap any of the air as would be the case if sharp curves or angles were present. Between the inclined portion 3 of the shell and the cylinder 2 is a space which is filled with soft metal 5 such as lead. The lower end of the mold is finished by securing thereto a ring 6 having an opening 7 which coincides with the opening 4. The ring may be of steel and secured to the cylinder 2 by screws 8. This ring covers the inclined portion 3 of the shell 1 and protects it against injury. It enables one to ream the congealed material along the line *a, a* since the ring 6 will protect the shell 1 against injury by the reaming knife. The lower end of the record will therefore be in its finished condition at the time it is removed from the mold.

In practice, the reaming knife passes very close to the bore of the ring 6, but does not ordinarily touch the same, the amount of clearance being exaggerated in the drawing. Any wax adhering thereto after the reaming operation may be easily wiped out before it hardens by the finger. The lower end of the bore of the ring is rounded as at 9, so that it is not easily dented and the formation of air bubbles is prevented.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A tubular mold having an inwardly extending lower portion surrounding an aperture, said portion merging into the main portion by a gentle curve, substantially as set forth.

2. A tubular mold having a lower taper-

ing portion extending inward and downward and terminating in a central opening, said tapering portion merging into the main portion by a gentle curve, substantially as set forth.

3. A tubular mold having a lower tapering portion extending inward and downward, and terminating in a central opening, said tapering portion gently curving toward the horizontal as it reaches the opening, substantially as set forth.

4. A tubular mold comprising an inner cylindrical shell extending inward at its lower end, a cylindrical backing surrounding said shell and a ring covering the bottom of said shell, substantially as set forth.

5. A tubular mold comprising an inner cylindrical shell, extending inward and downward at its lower end, a cylindrical backing surrounding said shell and a ring covering the bottom of said shell, substantially as set forth.

6. A tubular mold comprising an inner cylindrical shell of electro-deposited metal of substantially uniform thickness and extending inward at its lower end, a cylindrical backing surrounding said shell and a ring covering the bottom of said shell, substantially as set forth.

7. A tubular mold comprising an inner cylindrical shell, a cylindrical backing surrounding said shell and extending beyond the same at its upper end and a ring covering the bottom of said shell, substantially as set forth.

8. A tubular mold comprising an inner cylindrical shell extending inward and downward at its lower end, a cylindrical backing surrounding said shell, a filler be-

tween the backing and the inwardly extending portion of the shell and a ring covering the bottom of said shell, substantially as set forth.

9. A tubular mold comprising an inner cylindrical shell extending inward and downward at its lower end, a cylindrical backing surrounding said shell, a soft metal filler between the backing and inwardly extending portion of the shell, and a ring covering the bottom of said shell, substantially as set forth.

10. A tubular mold comprising an inner cylindrical shell extending inward at its lower end, a cylindrical backing surrounding said shell and a ring covering the bottom of said shell, said ring fitting closely against the bottom of the shell and having the same internal diameter as the smallest portion thereof, substantially as set forth.

11. A tubular mold comprising an inner cylindrical shell extending inward at its lower end, a cylindrical backing surrounding said shell, and a ring covering the bottom of the shell, the lower edge of the bore of said ring being rounded off, substantially as set forth.

12. A tubular mold comprising an inner cylindrical shell extending inwardly at one end, a cylindrical backing surrounding said shell and a ring covering the bottom of said shell and secured to the backing, substantially as set forth.

This specification signed and witnessed this 28th day of September, 1905.

EDWARD L. AIKEN.

Witnesses:

DELOS HOLDEN,
FRANK L. DYER.

H. SHEBLE & T. KRAEMER.
TALKING MACHINE.
APPLICATION FILED DEC. 21, 1908.

957,004.

Patented May 3, 1910.

Fig. 1,

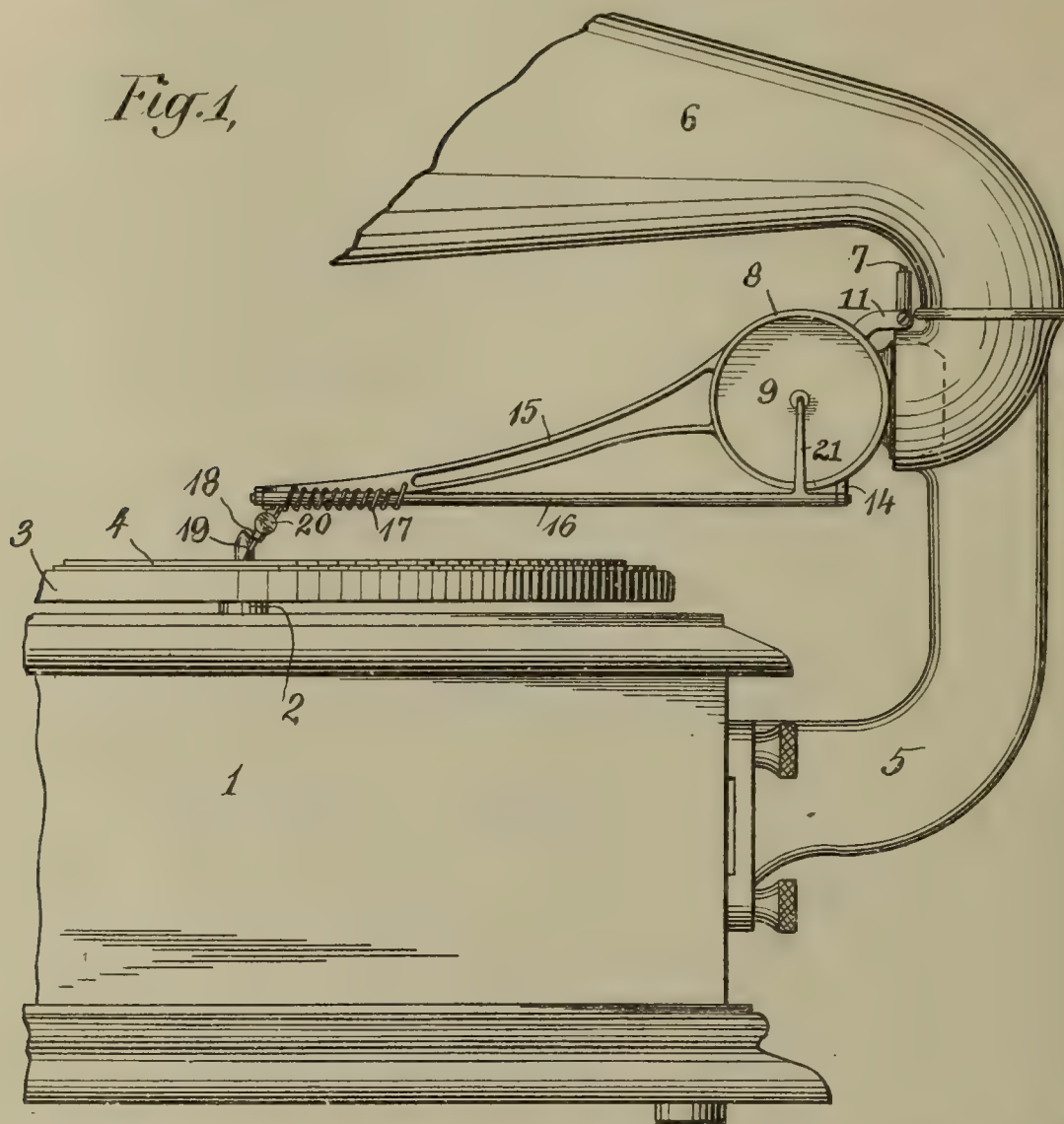
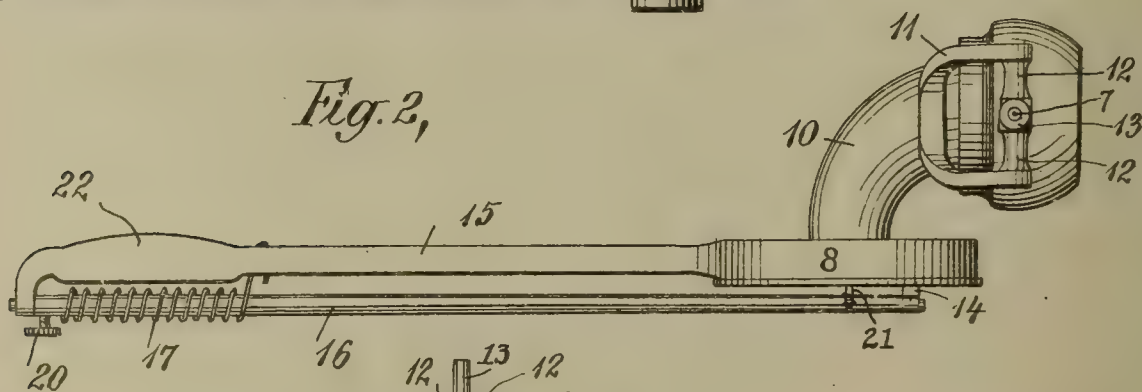


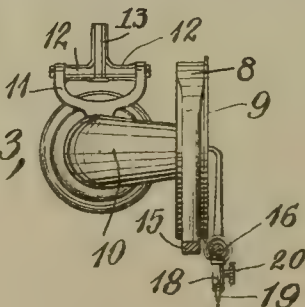
Fig. 2,



WITNESSES:

J. Edmunds
J. Bartlett

Fig. 3,



INVENTORS:

Horace Sheble & *Thomas Kraemer*

BY

J. Edmunds
ATTORNEYS

UNITED STATES PATENT OFFICE.

HORACE SHEBLE AND THOMAS KRAEMER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO HAWTHORNE & SHEBLE MANUFACTURING COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

TALKING-MACHINE.

957,004.

Specification of Letters Patent.

Patented May 3, 1910.

Application filed December 21, 1908. Serial No. 468,559.

To all whom it may concern:

Be it known that we, HORACE SHEBLE and THOMAS KRAEMER, both citizens of the United States, and both residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Talking-Machines, of which the following is a specification.

10 This invention relates to talking-machines, and its object is to provide a machine of an improved form, the improvements being directed particularly to the construction of the reproducing apparatus.

15 In accordance with the invention, the diaphragm of the reproducing apparatus, while being vibrated by the stylus, is located at a distance from the stylus, a rocking-bar being provided, to one end of which the stylus is
20 connected and which adjacent to its other end is provided with an arm coacting with the diaphragm of the sound-box so as to vibrate the latter.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 is an elevation of a portion of a talking-machine; Fig. 2 is a top view of the reproducing mechanism; and Fig. 3 is an
30 end view of the same.

Referring to these drawings, 1 indicates the motor-box of a talking-machine, within which is mounted a motor of the usual or any suitable type, this motor being arranged
35 to rotate a vertically-disposed shaft 2 projecting through the top of the box. Secured upon the shaft 2 is a turn-table 3 adapted to support a sound-record 4 which is in the form of a disk. Secured to the side of the
40 box 1 and projecting outwardly and upwardly therefrom is an arm 5 formed so as to provide an opening extending through the upper portion thereof. An amplifying horn 6 is adapted to be detachably mounted upon
45 the upper end of the arm 5, the opening through the horn being in communication with this opening formed in the arm 5. Adjacent to the inner end of the opening through arm 5, is a vertically-disposed pin 7.

50 The reproducing mechanism comprises a sound-box 8 having a diaphragm 9 mounted therein in the usual manner. Projecting from the side of the box 8 opposite the diaphragm 9 is a tube 10 bent to a curvature of

ninety degrees. To this tube is secured a
yoke 11 having a cross-head 12 pivoted
therein on horizontal pivots. This cross-head carries a sleeve 13 which is adapted to fit over the pin 7.

The sound-box 8 is provided with a short
60 downwardly-extending arm 14 and a long horizontally-extending arm 15, and a rod or shaft 16 is mounted upon these arms with its ends extending into openings formed therein, so that shaft 16 may rock upon its axis. A
65 spring 17 is coiled about the rod 16 and has one end secured to the rod and the other secured to the arm 15 so that when the rod 16 is rocked in one direction and then released it will be brought back to normal position by
70 the tension of spring 17. Secured to the rod 16 adjacent to its outer end, is a holder 18 for a stylus 19, this holder having a bore into which the end of the stylus is inserted and a set-screw 20 for holding the stylus securely
75 in this bore. Adjacent to the end of rod 16 opposite that to which holder 18 is secured, is an upwardly-extending arm 21, the free end of which bears against the center of the diaphragm 9 of the sound-box.
80

With the parts constructed and arranged as shown in Fig. 1 and the stylus 19 in holder 18 engaging the record-groove in a disk sound-record 4 on the turn-table 3, the rotation of the turn-table and record is begun
85 and the stylus tracks in the record-groove in the usual manner. As it does so, it is vibrated by the undulating groove-walls and rocks the rod 16 in its bearings in accordance with these vibrations. As the rod 16
90 is rigid against torsional strains, the vibrations of the stylus 19 are transmitted faithfully to the arm 21 secured to rod 16, and by arm 21 to the diaphragm 9 of the sound-box, and the sound-waves developed by the dia-
95 phragm 9 pass out through the tube 10, the opening formed in the upper end of arm 5 and the horn 6. The reproducing devices, including the sound-box 8, tube 10, bar 16 and stylus 19, can swing freely about a ver-
100 tical axis, in order that the stylus 19 may move across the sound-record, by the sleeve 13 turning upon pin 7. Also, the reproducing devices may move up and down sufficient to compensate for irregularities in the
105 sound-record or turn-table, by turning about the horizontal pivots connecting the yoke 11 with the cross-head 12.

In order to secure a good reproduction, the weight downwardly upon the stylus must be sufficient to cause the stylus to track faithfully in the record-groove, and as the sound-box in the construction above described is not located directly over the stylus as in the machines heretofore commonly employed, a weight corresponding more or less to the weight of the sound-box may have to be provided near the outer end of the arm 15. This may readily be done by enlarging the size of arm 15 so as to increase the weight of the outer end thereof. Such an increase in the size of the arm 15 is indicated at 22 in Fig. 2, and its size may be increased or diminished as may be found necessary in order to hold the stylus-point in the record-groove throughout the reproduction of the record.

Having now described our invention, what we claim as new therein and desire to secure by Letters Patent is as follows:—

In a talking-machine, a motor-box, a turntable for a disk sound-record supported thereby, a supporting-arm extending upwardly from the motor-box, a horn mounted thereon, a tubular member mounted on said arm to turn about a vertical axis and hav-

ing an opening therethrough in communication with the opening through the horn, a sound-box rigidly secured to said member and communicating therewith, an arm rigidly connected to said tubular member and sound box and projecting outwardly therefrom over the sound-record on said turntable, a rock-shaft pivotally mounted at one end in a bearing movable with said tubular member and at the other end in the end of said arm distant from the sound-box, a lever carried by said rock-shaft at one end thereof and coacting with the diaphragm of the sound-box, a stylus-support carried by said rock-shaft at the opposite end thereof, a stylus carried by said stylus-lever and adapted to track in the groove of a record on said turn-table, and a spring acting on said rock-shaft to turn it in one direction, substantially as set forth.

This specification signed and witnessed this 18th day of December, 1908.

HORACE SHEBLE.
THOMAS KRAEMER.

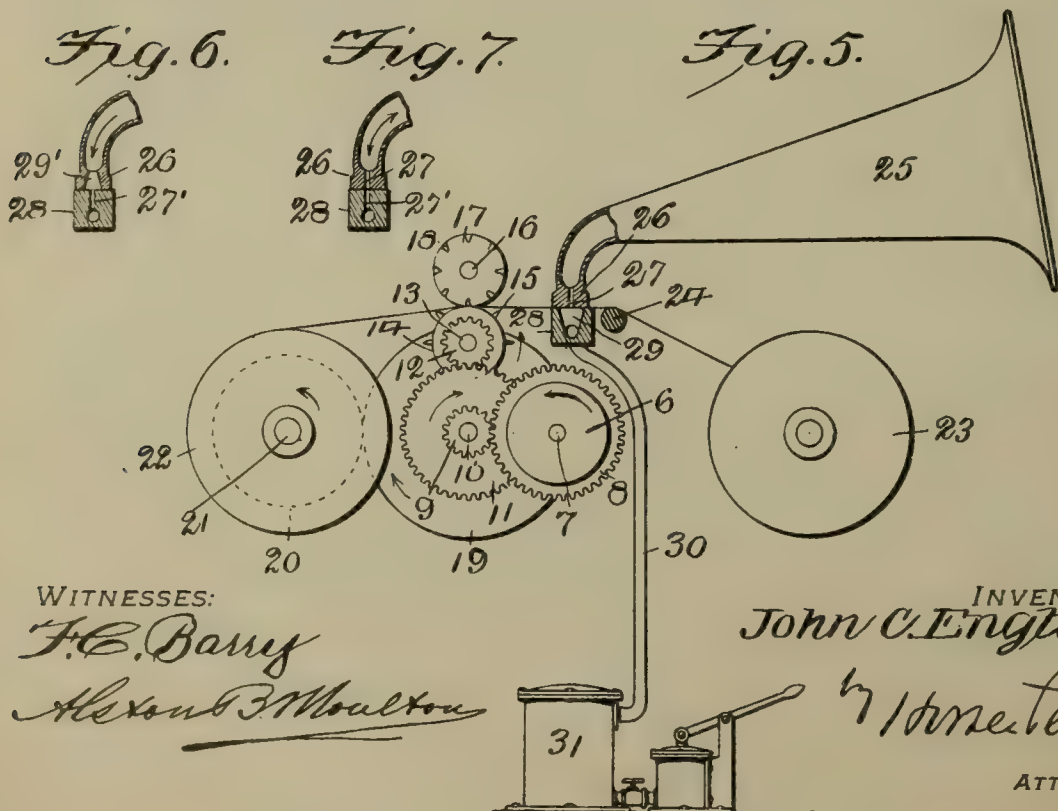
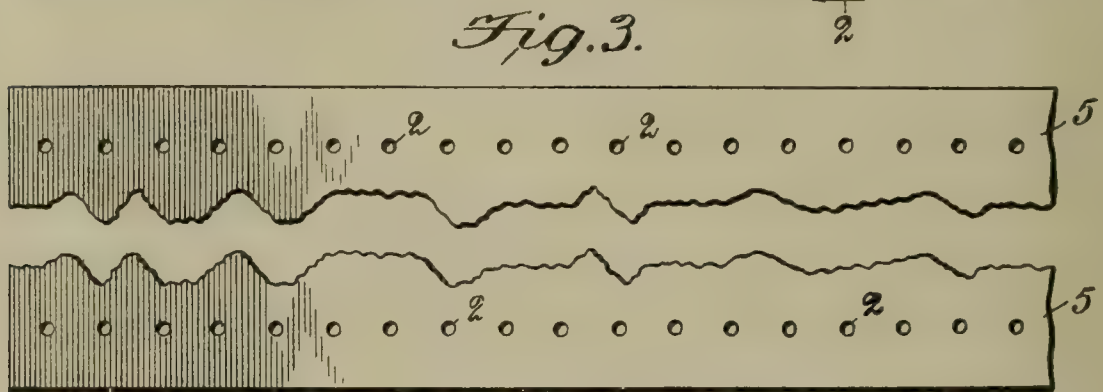
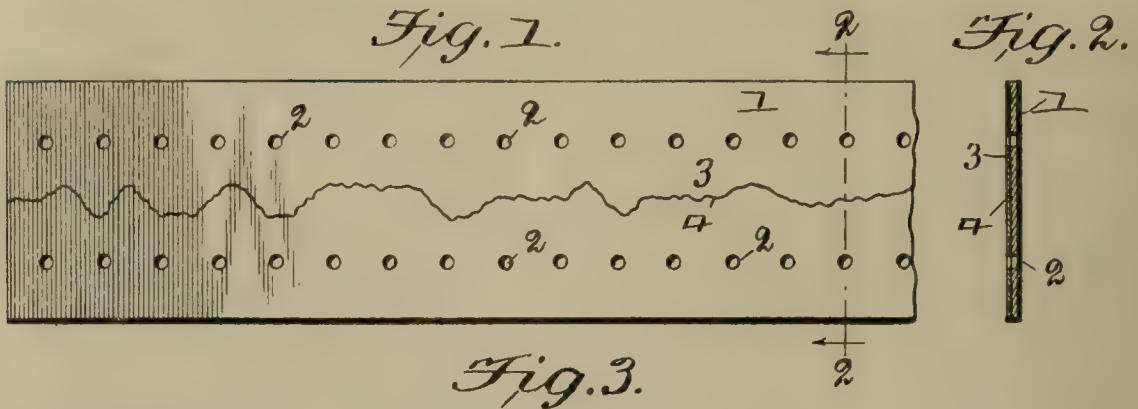
Witnesses:

HARRY L. STONE,
JOSEPH J. ROSENBLUTH.

J. C. ENGLISH.
METHOD OF RECORDING AND REPRODUCING SOUNDS.
APPLICATION FILED OCT. 14, 1905.

957,195.

Patented May 10, 1910.



UNITED STATES PATENT OFFICE.

JOHN C. ENGLISH, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

METHOD OF RECORDING AND REPRODUCING SOUNDS.

957,195.

Specification of Letters Patent.

Patented May 10, 1910.

Application filed October 14, 1905. Serial No. 282,733.

To all whom it may concern:

Be it known that I, JOHN C. ENGLISH, a citizen of the United States, and resident of the city of Camden, county of Camden, State of New Jersey, have invented certain new and useful Improvements in Methods of Recording and Reproducing Sounds, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to a method of making a permanent undulatory record of sounds, articulate, musical or produced in any manner, and, further to the method whereby recorded sounds are reproduced without the use of a reproducing stylus.

In the methods of reproducing sound heretofore known, it has been proposed to record upon a suitably prepared surface, a record of the sound waves produced in the vicinity of the recording mechanism; to make from said record a duplicate in some suitable and durable material; and then to cause a reproducing stylus to follow the undulations recorded on said record to produce vibrations in a reproducing diaphragm similar to those originally impressed upon the recording diaphragm. In instruments constructed in accordance with the above principle, however, the sounds emanating from such reproducing apparatus, while approximately close to the sounds originally produced, are more or less imperfect and unsatisfactory by reason of the additional sounds and tones, added to the sounds originally recorded, and caused by the scraping or scratching of the reproducing stylus upon the record, as it follows the undulatory groove in the same.

The present invention has for one of its objects the forming of an original or master record of sound in the form of a tape, one of the edges of which is provided with undulations corresponding to sound waves to form a master record of sound and to form from said master record one or more duplicate copies of said master record for commercial use.

A further object of my invention is to form commercial duplicate profile tapes for use in connection with sound reproducing machines, which profile tapes are substantially duplicates or copies of an original record.

A further object of my invention is to pro-

duce commercial duplicate records from a master record of sound by means of a profile mechanism.

A further object of my invention will appear in the specification and claims below.

My invention consists in forming a permanent record of the sound originally produced and causing said record to travel through a fluid current and to impress upon said fluid current the undulations recorded on the said record.

More specifically my invention consists in forming along one edge of a suitable tape a series of undulations or serrations corresponding to the waves of the sound originally produced, and causing the edge of said tape to travel over a narrow slit or elongated opening through which a current of air is caused to pass, said tape being so located with respect to said opening that the edge of the tape having the undulations thereon, will at all times partially close said opening, whereby the size of opening is constantly varied by the variations on the edge of the tape, and the current of air passing through said opening will have impressed upon it vibrations or undulations which are an exact reproduction of the sound originally recorded on the tape.

My improved method of recording and reproducing sound may be put into effect by means of a variety of apparatus, one method being illustrated in the accompanying sheet of drawings, in which—

Figure 1 represents on an exaggerated or magnified scale, a portion of a suitably prepared tape upon which the sound waves have been recorded in the form of longitudinal series of transverse undulations; Fig. 2 is a section thereof on the line 2, 2, Fig. 1; Fig. 3 illustrates the manner in which the tape shown in Fig. 1 is divided longitudinally along the line of the record to form two master records; Fig. 4 illustrates a paper duplicate made from said master record; Fig. 5 shows one form of a reproducing apparatus employed to produce the sounds recorded on the edge of the record; Fig. 6 illustrates a modified construction in which the air is drawn through the aperture from the horn and Fig. 7 illustrates another modification in which the air may be forced through the aperture in either direction.

In carrying out my invention, I prepare a

flexible metallic tape, 1, provided preferably with two longitudinal series of equally spaced perforations 2, by coating one or more surfaces thereof with any suitable substance which will serve to record the vibrations of a recording stylus, the cutting point of which oscillates in a plane substantially parallel to the said record surface. The point or cutting edge of said stylus is made of a suitable hard material and is so located with respect to said tape, that the tracing made thereby cuts through the coating material 3, and forms an undulatory channel 4, the bottom of which is formed by the metal tape itself. The perforations in the tape serve the purpose of engaging the teeth of a suitable feed roller, which may be driven at a constant rate of speed, to feed the prepared tape under the record stylus in the direction of its length, without slip or variation in speed. In Figs. 1 and 2 is illustrated a tape upon the surface of which a record groove has been traced in the manner above described, the coating 3 being cut through to the metal tape 2, as shown in Fig. 2.

In the actual practice of my invention, I may increase the amplitude and sharpness of the undulations recorded on the tape, with a view to making the variations on the profile as pronounced as possible, and I accomplish this by a variety of means such as by locating the position of the center of oscillation of the stylus bar nearer to the center of the recording diaphragm, or by increasing the length of the stylus bar on that side of the center of oscillation which carries the stylus, and also by causing the record surface to travel at a lower rate of speed than is now usually employed.

The next step in my improved process consists in removing one half of the material of the tape at one side of the groove. I preferably do this by dividing the tape longitudinally along the line of the record by filling the groove with some suitable chemical agent which will not act upon the coating material but will cut through the metal tape along the line of the record. I then remove the coating material in any suitable manner. By these or similar steps, I am enabled to produce two metallic tapes 5, 5, each of which has on its edge an exact profile record of the sounds originally produced, and each of which also has a series of perforations 2 by which said tape may be positively fed, or caused to travel over or under a reproducer. It is, however, within the scope of my invention to remove one half of the metallic record tape in any suitable manner, and in removing it, to completely destroy the same, in order to produce one perfect profile tape, although I preferably form two master tapes in the manner described above.

In Fig. 5 I have illustrated one form of apparatus in which my improved method of reproducing sound may be performed in which 6 represents a driving drum mounted upon shaft 7 to which is secured a gear 8 adapted to mesh with the gear 9 fixed to the shaft 10. The shaft 10 has also secured to it a second gear 11 meshing with the gear 12 fixed to the shaft 13. Also secured to the shaft 13 is a feed roller 14 having pins 15 adapted to engage perforations 2 of the tape 5'.

For the purpose of securing a positive engagement of the pins 15 with the tape, I may mount on a suitable shaft 16 located above the feed roller 14, a roller 17 provided with holes 18 which will register with the teeth or pins 15 and press the pins through perforations of the tape. Also mounted upon the shaft 10 is a friction roller 19 which is adapted to contact and drive the cooperating roller 20 mounted on the shaft 21 of the winding reel 22.

23 indicates reel from which the profile tape is supplied and from which tape is led over the guide roller 24 to the sound reproducing device.

Mounted in a suitable position adjacent to profile tape is a horn 25 or other suitable sound amplifying device, with the small end 26 adjacent to the surface of the tape. In the form of my invention illustrated in Fig. 5 this smaller end of the horn is provided with a narrow elongated slit or opening 27, the direction of which is transverse to the direction of the tape. The relation of the position between end slit or opening of the tape is shown diagrammatically in two positions in Fig. 4.

In Fig. 5 beneath the narrow opening 27 and adjacent to tape is a block 28 provided with a chamber 29 connected by a pipe or tube 30 with the air chamber 31, off a suitable pump, which may be used to produce either a pressure or a partial vacuum in the chamber 31.

The operation of this device is as follows: The drum being driven from any suitable source of motive power, its motion is communicated through the gears 8, 9, 11 and 12 to the feed roller 14, and through the friction drums 19 and 20 to the winding drum 22. The relation of the friction drums 19 and 20 being such that the winding drum 22 will always be driven at a speed which will keep the tape taut between the feed roller 15 and said winding drum 22. Air being forced from the chamber 31 through pipe 30 to the chamber 29 and one end of the elongated opening being always open and free to permit a column of air to pass through the same, as indicated in Fig. 4, the tape 5' is driven over the opening 27. The varying contour of the tape will constantly change the size of the opening through which the

air may pass, and consequently will produce variations in the column of air passing through the opening. The undulations or vibrations in the column of air allowed to pass through the opening will correspond to the undulations recorded on the profile of the tape. In this manner, the column of air will have impressed upon it undulations or vibrations which are the exact reproductions of the sound originally produced and recorded on the tape and when such vibrations are amplified through the horn 24, the result is a clear, loud and exact reproduction of the original sounds free from any disagreeable and undesirable qualities resulting from the scratch of a reproducing stylus over a record.

Fig. 6 indicates a modified construction in which the narrow slit or elongated opening 27' is located in the lower block 28 and the smaller end 26 of the horn 25 has a chamber 29' adjacent to tape. In this form of my invention the direction of the current of air would be reversed to what it is in apparatus shown in Fig. 5, and the pump would be used to produce a partial vacuum in chamber 31.

In Fig. 7 I have shown both the smaller end of the horn and the lower block as being provided with registering elongated openings 27, 27' respectively, and in this form of my invention the current of air may be impelled in either direction.

While I have described my invention in the form above set forth, it is obvious that it would be impracticable to use a metallic profile tape, formed as above described as a commercial record. I therefore propose to use either one or both of the tapes shown in Fig. 3 as master tapes, and produce duplicates thereof in a material suitable for commercial purposes. I have found that a tape of a good quality of stiff paper will answer all the requirements. The commercial paper tapes may be produced in large quantities from said master tapes in the following manner: A large number of plain strips of paper having been brought together and stacked under compression, the master tape is caused to guide or form a templet for a suitable profiling machine, while the cutting end of the machine is caused to travel transverse to the stacked tapes and to reproduce upon the edges thereof an exact copy of said master tape. A paper duplicate of the original master record made in this manner is indicated by Figs. 4 and 5.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States, is:—

1. The method of forming commercial profile tapes for use in sound reproducing devices which consists in forming a master

profile tape, and duplicating said master record by means of a suitable profiling machine upon a plurality of layers of paper tapes.

2. The method of forming commercial profile tapes for use in sound reproducing devices which consists in forming a master profile tape, using said master tape as a templet in a suitable profiling machine, and causing the cutting point of said profiling machine to reproduce the undulations of the master tape simultaneously on the edges of a plurality of stacked blank paper tapes.

3. The method of forming commercial profile tape for use in sound reproducing devices, which consists in forming a master profile metallic tape, and using said master tape as a templet for reproducing simultaneously a plurality of commercial duplicates thereof.

4. The method of forming commercial profile tape for use in sound reproducing devices, which consists in forming a master profile metallic tape, and using said master tape as a templet for reproducing simultaneously a plurality of commercial paper duplicates thereof.

5. The method of forming commercial profile tapes for use in sound reproducing devices, which consists in forming a master profile tape and duplicating said master tape by means of a profiling machine acting upon a plurality of stacked and compressed tapes.

6. The method of forming commercial profile tapes for use in sound reproducing devices, which consists in forming a master profile record and duplicating said master record simultaneously upon the edges of a plurality of tapes.

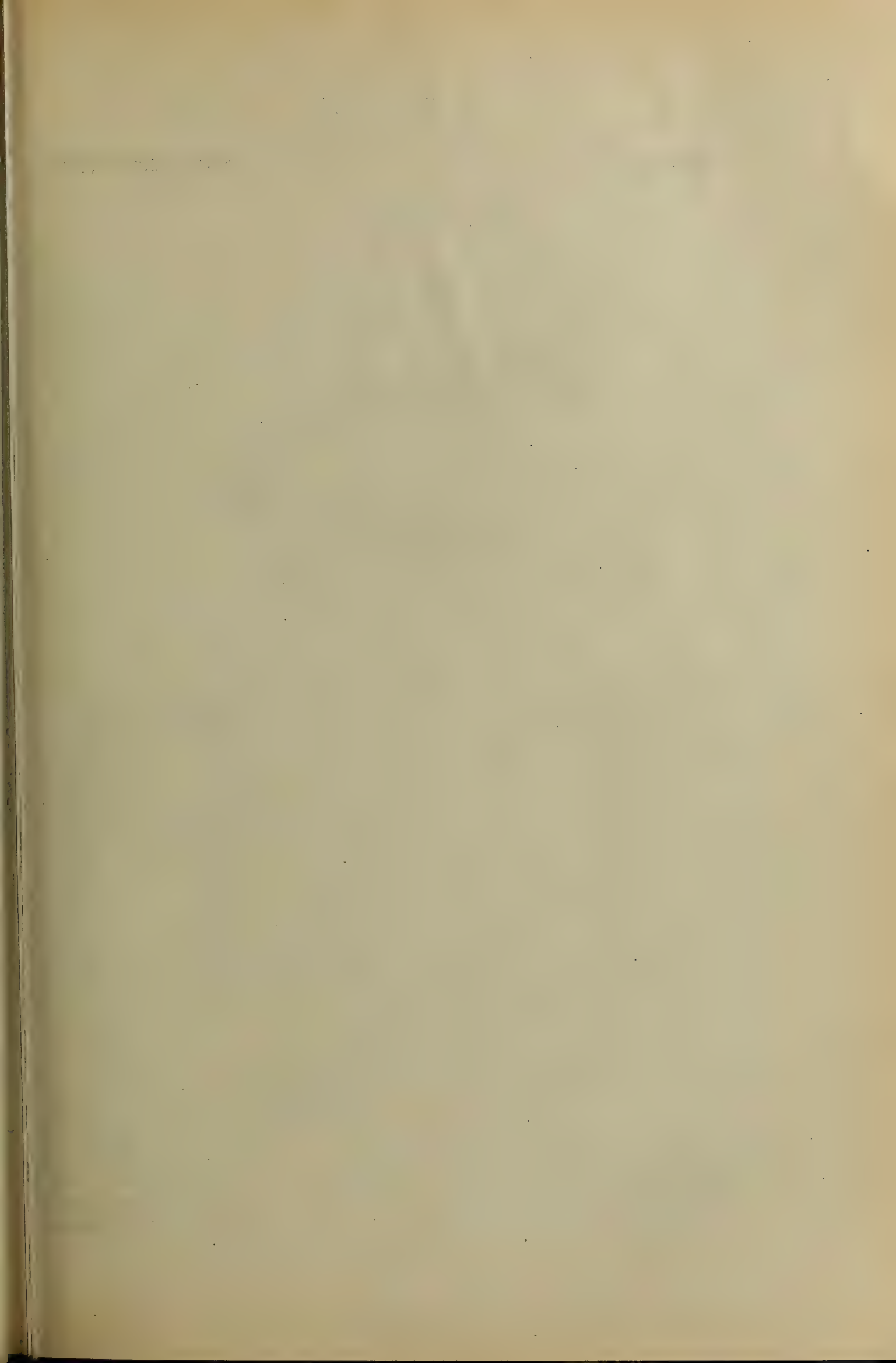
7. The method of forming commercial profile tapes for use in connection with sound reproducing devices which consists in forming a master tape one edge of which is provided with an undulating contour corresponding to sound waves, stacking and compressing together a plurality of paper tapes and placing them in a profiling machine, substantially simultaneously cutting one edge of said stacked tapes by said profiling mechanism, in which the said master tape is used as a templet for guiding the cutting tool, whereby a plurality of paper tapes substantially identical with each other and corresponding to said master tape are produced.

In witness whereof, I have hereunto set my hand this thirteenth day of October, A. D., 1905.

JOHN C. ENGLISH.

Witnesses:

ALSTON B. MOULTON,
ALEXANDER PARK.

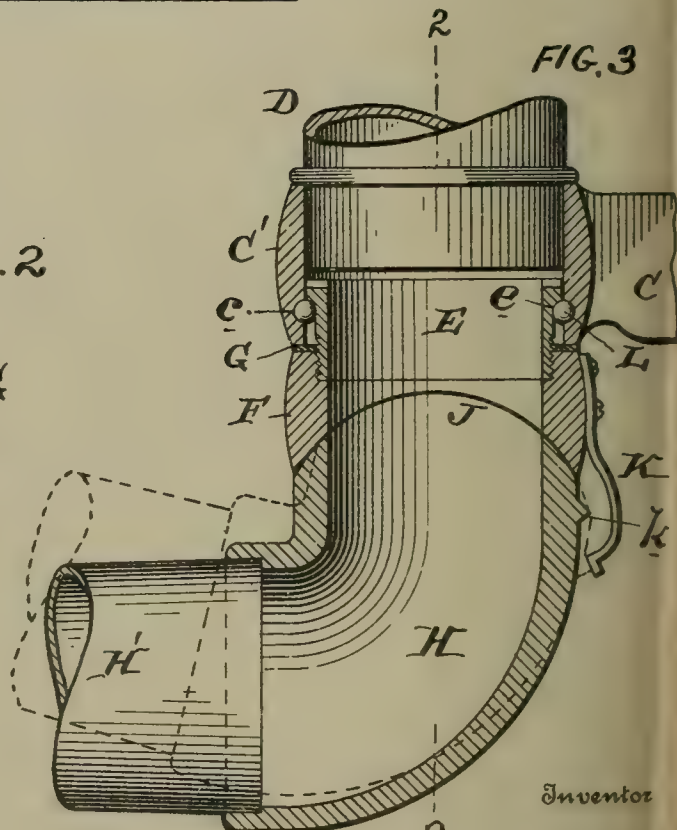
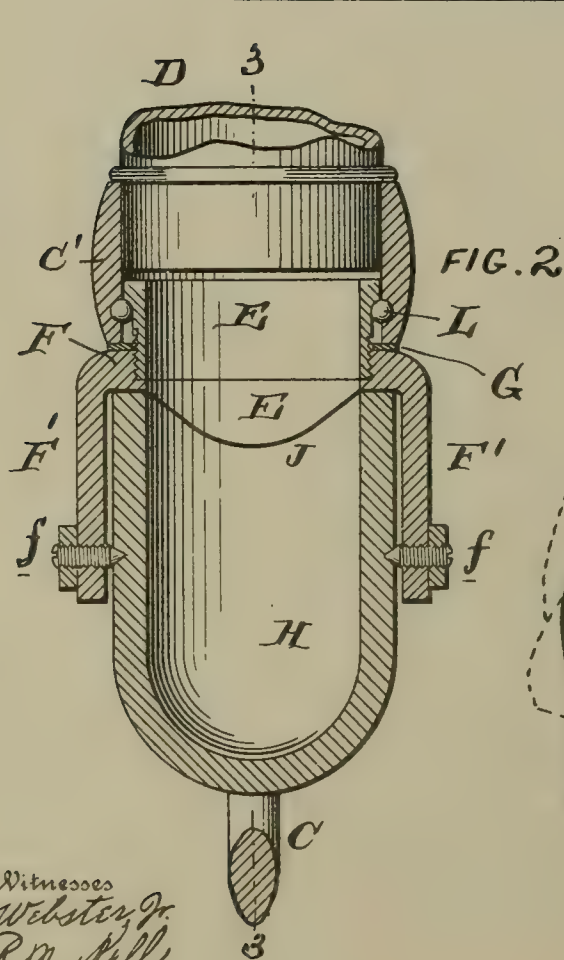
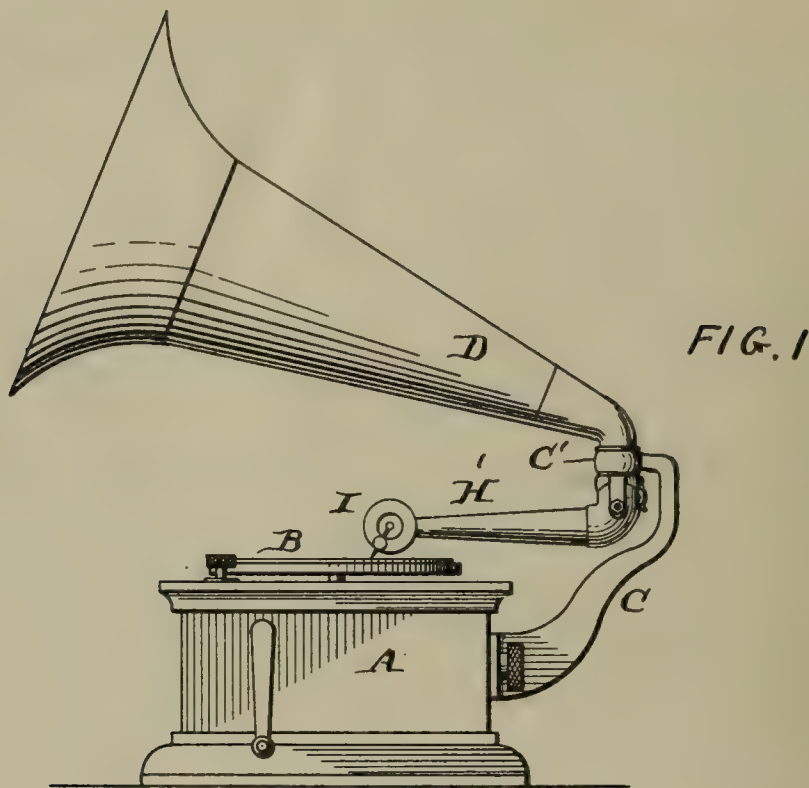


R. L. GIBSON.
TALKING MACHINE.

APPLICATION FILED MAY 2, 1905.

957,206.

Patented May 10, 1910.



Witnesses
D. Webster, Jr.
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By

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Attorney

UNITED STATES PATENT OFFICE.

ROBERT L. GIBSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

TALKING-MACHINE.

957,206.

Specification of Letters Patent.

Patented May 10, 1910.

Application filed May 2, 1905. Serial No. 258,442.

To all whom it may concern:

Be it known that I, ROBERT L. GIBSON, of the city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in Talking-Machines, of which the following is a specification.

My invention has reference to talking machines and consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawing which forms part thereof.

The object of my invention is to provide a construction of universal arm for the sound box which shall embody simplicity and capacity for movement with the least possible resistance.

In carrying out my invention, I provide a bracket having a tubular neck adapted to support the horn, and combine therewith a tubular arm carrying the sound box at its free end and having the other end journaled in the neck of the bracket through the medium of antifriction balls said balls fitting into a groove semicircular in cross section formed in the neck of the bracket and supporting a flange secured to the pivoted end of the tubular arm whereby the arm is centralized and supported by the balls.

My invention also comprehends details of construction which, together with the features above specified will be better understood by reference to the drawings, in which:

Figure 1 is a side elevation of a gramophone or talking machine embodying my invention; Fig. 2 is a sectional elevation on line 2—2 of Fig. 3 showing the manner of supporting the tubular arm which carries the sound box; and Fig. 3 is a similar view on line 3—3 of Fig. 2.

A is the motor box or case which rotates the table or support B carrying the record disk.

C is a bracket or arm secured to the side of the box or case A and terminating in a tubular end C', the aperture having a vertical axis.

The horn D is supported by the bracket and is sleeved into the tubular part so as to be adjustable thereon and permit the horn to be turned in any direction in which the sound waves are to be propagated.

H' is a tubular arm carrying at its free end the sound box I and having its other

end terminating in a vertical tubular portion F adjustably connecting with the tubular portion C' of the bracket whereby said arm may swing thereon as a center. More specifically this connection consists of the tubular part F into which is screwed or otherwise secured a bushing E having a flange *e* the diameter of which is less than the internal diameter of the tubular end C' of the bracket C. The interior of the end C' is provided with a groove *c* near its lower part which forms a trackway; and said groove is made preferably semi-circular in cross section to receive a series of anti-friction balls L and in which said balls are free to travel, they being held therein by the tubular bushing E having its flange *e* resting upon the balls. In this manner the vertical tubular part F of the tubular arm H' is free to rotate about a vertical axis with the least possible frictional resistance.

To prevent any rattling or grinding between the parts C' and F, I prefer to place between them an annular washer G of insulating or non-metallic composition. This washer should not be sufficiently thick to produce any binding or undue friction.

The parts F and H' of the tubular arm are jointed on a transverse axis. To secure this structure, I provide the part F with downwardly extending side arms F' which have pivot screws *f* upon which the elbow part H of the arm H' rotates. This part H' is preferably made with a taper, being larger adjacent to the pivots *f* and also turned upward in an elbow H. The juncture of this elbow and part F is made in a cylindrical plane whose axis is the pivots *f*. This junction of the two parts H and F is indicated at J and is preferably formed with a very slight clearance so as not to create any friction between the said parts H and F, but not enough of clearance to permit air waves to escape, and in that way reduce the effectiveness of the articulation.

To enable the free end of the arm H' to be turned up and held out of the way of the record tablet when replacing it with a new one, I provide a spring catch K on the part F which engages a lug *k* on the elbow H of the tubular arm H'. This supports the free end of the arm in an elevated position together with the sound box. When the arm is lowered into sound producing position with the stylus of the sound box resting

upon the record tablet, the lug *k* of the arm is above and clear of the spring catch *K* as shown and consequently there is no interference with the free movement of the arm both vertically and laterally at its free end. The weight of the part *II'* of the arm pulls down upon the pivots *f* during sound reproduction and consequently the support of the part *F* upon the balls is uniform and evenly distributed, so that there is no material friction. This freedom of lateral movement enables the stylus to follow the grooves of the record tablet without material resistance thereby enabling a more sensitive response by the sound box to the variations of the record grooves upon the stylus.

While I prefer the construction shown, I do not confine myself to the details as these may be modified in various ways without departing from the spirit of my invention.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a talking machine the combination of the bracket having a tubular end having a trackway for antifriction balls, a tubular arm carrying at one end a sound box, a flanged bushing secured to the other end of the tubular arm and having an external diameter smaller than the internal diameter of the tubular end of the bracket, antifriction balls arranged between the trackway and the flange of the bushing for supporting the pivoted end of the tubular arm, and a horn supported upon the tubular end of the bracket independent of the bushing and pivoted arm.

2. In a talking machine the combination of the bracket having a tubular end having a trackway for antifriction balls, a tubular arm carrying at one end a sound box, a flanged bushing secured to the other end of the tubular arm and having an external diameter smaller than the internal diameter of the tubular end of the bracket, antifriction balls arranged between the trackway and flange of the bushing for supporting the pivoted end of the tubular arm, a non-metallic washer surrounding the bushing and interposed between the upper end of the tubular arm and bottom of the tubular end of the bracket, and a horn supported upon the tubular end of the bracket independent of the bushing and pivoted arm.

3. In a talking machine the combination of the bracket having a tubular end having a trackway for antifriction balls, a tubular arm consisting of a vertical pivoted part and a horizontal tubular part carrying at one end a sound box and having its other end pivoted to the vertical pivoted part so as to swing vertically about a transverse axis, a flanged bushing secured to the vertical tubular part of the arm and having an

external diameter smaller than the internal diameter of the tubular end of the bracket, antifriction balls arranged between the trackway and flange of the bushing for supporting the pivoted end of the tubular arm, and a horn supported upon the tubular end of the bracket independent of the bushing and pivoted arm.

4. In a talking machine the combination of the bracket having a tubular end having a trackway for antifriction balls, a tubular arm consisting of a vertical pivoted part and a horizontal tubular part carrying at one end a sound box and having its other end pivoted to the vertical pivoted part so as to swing vertically about a transverse axis, a flanged bushing secured to the vertical tubular part of the arm and having an external diameter smaller than the internal diameter of the tubular end of the bracket, antifriction balls arranged between the trackway and flange of the bushing for supporting the pivoted end of the tubular arm, a spring catch to hold the horizontal tubular part of the arm in an elevated position upon the vertical tubular part, and a horn supported upon the tubular end of the bracket independent of the bushing and pivoted arm.

5. In a talking machine, the combination with a bracket having a tubular end provided with a groove for antifriction balls, a horn supported upon the tubular end, a tubular arm carrying at one end a sound box, and having its other end turned upward beneath the tubular end of the bracket, a flanged bushing secured upon the upwardly turned end of the tubular arm, and antifriction balls fitting into the groove of the tubular end of the bracket and supporting the flange of the bushing.

6. In a talking machine, the combination with a bracket having a tubular end provided with a groove semicircular in cross section for antifriction balls, a horn supported upon the tubular end, a tubular arm carrying at one end a sound box, and having its other end turned upward beneath the tubular end of the bracket, a flanged bushing screwed upon the upwardly turned end of the tubular arm, and antifriction balls fitting into the groove of the tubular end of the bracket and supporting the flange of the bushing.

7. In a talking machine, the combination with a bracket having a tubular end provided with a groove for antifriction balls, a horn supported upon the tubular end, a tubular arm carrying at one end a sound box and having the other end turned upward beneath the tubular end of the bracket and also being jointed so that the sound box end may be turned upward, means to support the end of the arm in its turned up position, a flanged bushing secured upon the upwardly

turned end of the tubular arm, and antifric-
tion balls fitting into the groove of the tu-
bular end of the bracket and supporting the
flange of the bushing.

5 8. In a talking machine, a hollow support,
a stationary horn carried by the hollow sup-
port, a tubular arm formed of two parts
hinged together upon a transverse axis near
10 the hollow support one part being entirely
supported from within said support to
swing upon a vertical axis and the other
part carrying the sound box, and a spring
catch connected to one of the parts of the tu-
15 bular arm adapted to catch upon the other
part of the arm to lock the sound box end
of the arm in an elevated position when
sufficiently raised, but at all other times to
be out of locking contact.

9. The combination of a swinging arm
20 carrying the reproducer at one end, a tubu-
lar support, a ring mounted on said tubular
support to turn in a horizontal plane side
arms depending from said ring and trun-
nions outside of said support connecting
25 said side arms to the swinging arm to per-
mit said arm to turn in a vertical plane.

10. The combination of a swinging arm
carrying the reproducer at one end, a sta-
tionary arm having a circular opening pro-
30 vided with a circular bearing upon its inner
wall, supporting means supported by and to
turn upon said bearing and horizontal trun-
nions supported by said means outside of
said opening and engaging said swinging
35 arm at its other end to permit vertical move-
ment of said swinging arm.

11. In a talking machine the combination
with a sound conveying tube, a fixed support
having a circular opening therein, a horizon-
40 tal circular bearing provided upon one of
said parts, circular supporting means for
said tube conforming to said opening and
tube and engaging said bearing to support
said tube and to permit horizontal swinging
45 movement of said tube and opposite hori-
zontal trunnions supported by said fixed
support outside of said circular opening to
support said conveying tube and to permit
vertical swinging movement of said convey-
50 ing tube.

12. In a talking machine, the combination
with a support having an opening therein,
of a hollow bushing rotatably mounted and
entirely supported from within said open-
55 ing and having a portion projecting outside
of said opening, and a tubular sound box
arm communicating with said bushing, and
wholly supported by said projecting portion.

13. In a talking machine, the combination
60 with a support having an opening therein,
of a hollow bushing rotatably mounted and
entirely supported from within said open-
ing and having a portion projecting outside
of said opening, a tubular sound box arm
35 communicating with said bushing and

wholly supported by said projecting por-
tion, said sound box arm comprising rela-
tively movable intercommunicating portions.

14. In a talking machine, the combination
with a support having an opening, of a 70
flanged bushing mounted to oscillate in said
opening and projecting from said support, a
sound box arm threaded upon said bushing,
and an annular washer of insulating mate-
75 rial surrounding said bushing between and
in contact with said arm and said support.

15. In a talking machine, the combination
with a support having an opening, of a
flanged bushing mounted to oscillate in said
opening and projecting from said support, a 80
jointed sound box arm threaded upon said
bushing, and an annular washer of insulat-
ing material surrounding said bushing be-
tween and in contact with said arm and said
support. 85

16. In a talking machine, the combination
with a support having a cylindrical opening
provided with an internal groove substan-
tially semi-circular in transverse section, a
flanged bushing in said opening, balls 90
mounted in said groove and supporting said
flanged bushing, and a tubular sound box
arm carried by said bushing and communi-
cating therewith.

17. In a talking machine, the combination 95
with a support having a cylindrical opening
provided with an internal groove substan-
tially semi-circular in transverse section, a
flanged bushing in said opening, balls
mounted in said groove and supporting said 100
flanged bushing, and a jointed tubular sound
box arm carried by said bushing and com-
municating therewith.

18. In a talking machine, the combination 105
with a support having a cylindrical opening
provided with an internal groove substan-
tially semi-circular in transverse section, a
flanged bushing in said opening, balls
mounted in said groove and supporting said 110
flanged bushing, a jointed tubular sound box
arm carried by said bushing and communi-
cating therewith, and an annular washer of
insulating material surrounding said bush-
ing and between and in contact with said
support and said arm. 115

19. In a talking machine, the combination
with a support provided with an opening, of
a bushing mounted in said opening, a tubu-
lar sound box arm comprising two communi-
cating portions, one of said portions being 120
rigidly secured to said bushing and commu-
nicating therewith, side arms depending
from said portion, and a pivotal connection
between said side arms and said other por-
tion of said sound box arm. 125

20. The combination with a support hav-
ing an opening, of a hollow bushing rota-
tably mounted in said opening and having
a portion projecting outside of said open-
ing, anti-friction balls between the interior 130

of said support and the exterior of said bushing, and a tubular sound box arm communicating with said bushing and wholly supported by said projecting portion.

5 21. The combination with a support having an opening, of a hollow bushing having one end flanged and supported within said opening and its other end projecting outside of said opening, anti-friction balls be-
10 tween said flanged end and the interior of said support, and a tubular sound box arm carried by said projecting end.

22. In a talking machine, the combination with a support having an opening, of a hol-
15 low bushing rotatably mounted upon a fixed axis and entirely supported from within said opening and having a portion projecting outside of said opening, and a tubular sound box arm communicating with said bushing
20 and wholly supported by said projecting portion.

23. In a talking machine, the combination with a support having an opening, of a hol-
25 low bushing rotatably supported entirely from within said opening, a pair of arms supported by said bushing and extending outside of said opening, a tubular sound box arm communicating with said bushing, and
30 a pivotal connection between said pair of arms and said sound box arm, said sound box arm being entirely supported through said pivotal connection.

24. In a talking machine, the combination with a support having an opening, of a hol-
35 low rotatable bushing within said opening, and having one end projecting outside of said support, rotatable anti-friction means between the interior of said support and the exterior of said bushing forming the
40 sole support for said bushing, and a tubular sound box arm carried by said projecting end.

25. In a talking machine, the combination with a support having an opening, of a hol-
45 low rotatable bushing within said opening, rotatable anti-friction means between the interior of said support, and the exterior of

said bushing, and a hollow sound box arm entirely supported by said bushing, said sound box arm being formed of relatively 50 movable inter-communicating portions.

26. In a talking machine, the combination with a case, of a bracket secured thereto and extending upwardly therefrom and termi-
55 nating in a tubular end, a rotatable bushing entirely supported from within said tubular end, and having an end projecting outside thereof, and a tubular sound box arm entirely supported by said projecting end.

27. In a talking machine, the combination 60 of a tubular support having an internal track way for rotary anti-friction means, a rotatable bushing in said tubular support and having an external diameter smaller than the internal diameter of the support, 65 anti-friction means arranged between the track way and the bushing, sound amplifying means carried by said tubular support, and a tubular sound box arm carried by
70 said bushing.

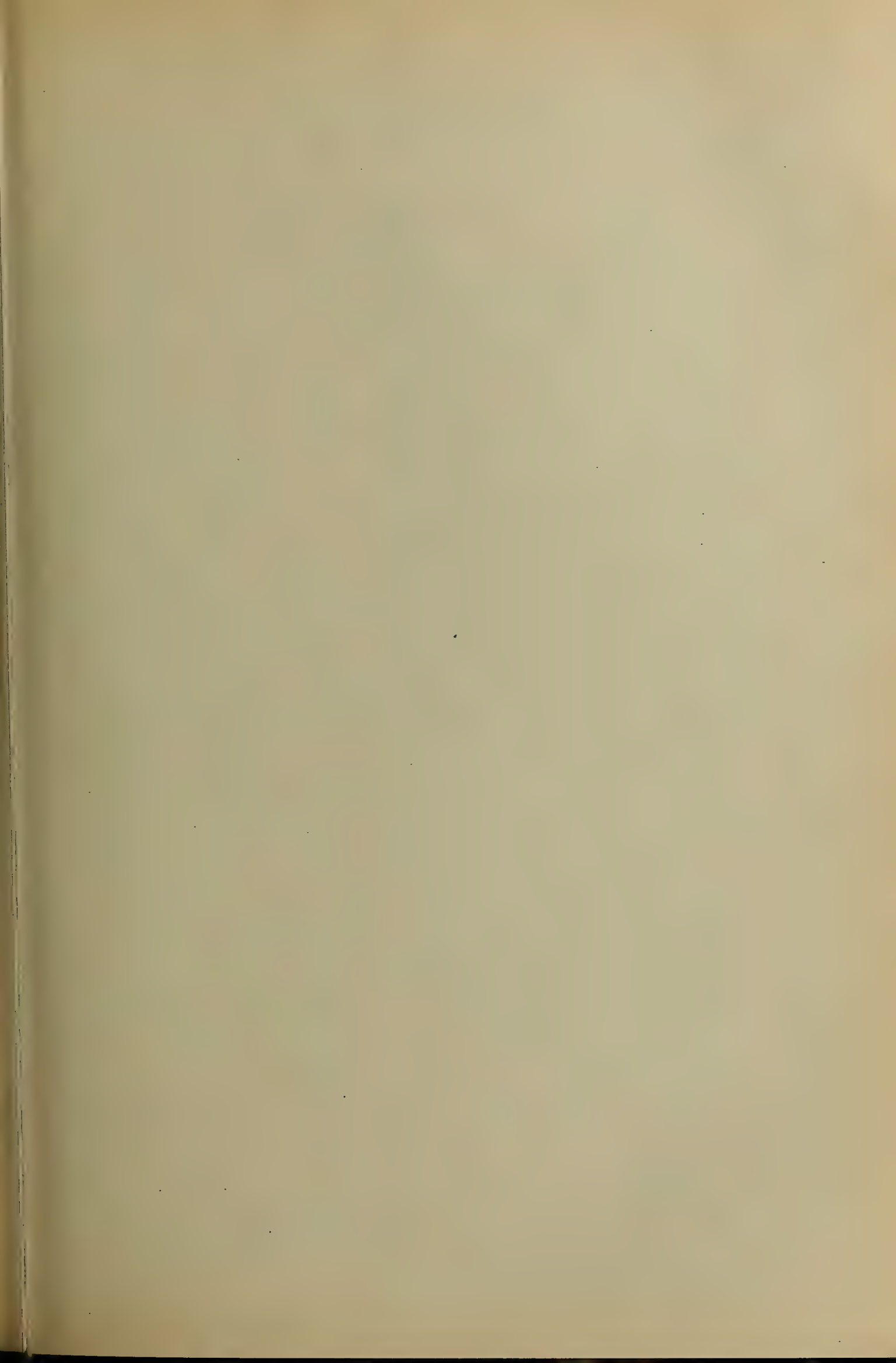
28. The combination with a bracket at-
tached at one end to the casing of a talking machine and having a tubular socket at its free end, of a rotary sleeve carried by said socket and having its lower end projecting 75 beyond the lower edge of said socket, an adjustable piece carried by said projecting end of the rotary sleeve, horizontal pivots supported by said ring piece, a sound conveying arm supported by said pivots and 80 having an upturned and curved end, a tubular piece having a complementary curved lower end interposed between the ring piece and the upturned curved end of the sound conveying arm, and a yielding 85 cushion interposed between the said tubular piece and said ring piece.

In testimony of which invention, I here-
unto set my hand.

ROBERT L. GIBSON.

Witnesses:

J. WALTER HILLIARD,
JAS. R. NECK.



W. C. MILLS.
 AUTOMATIC BRAKE FOR PHONOGRAPHS.
 APPLICATION FILED MAY 28, 1909.

957,570.

Patented May 10, 1910.

2 SHEETS—SHEET 2.

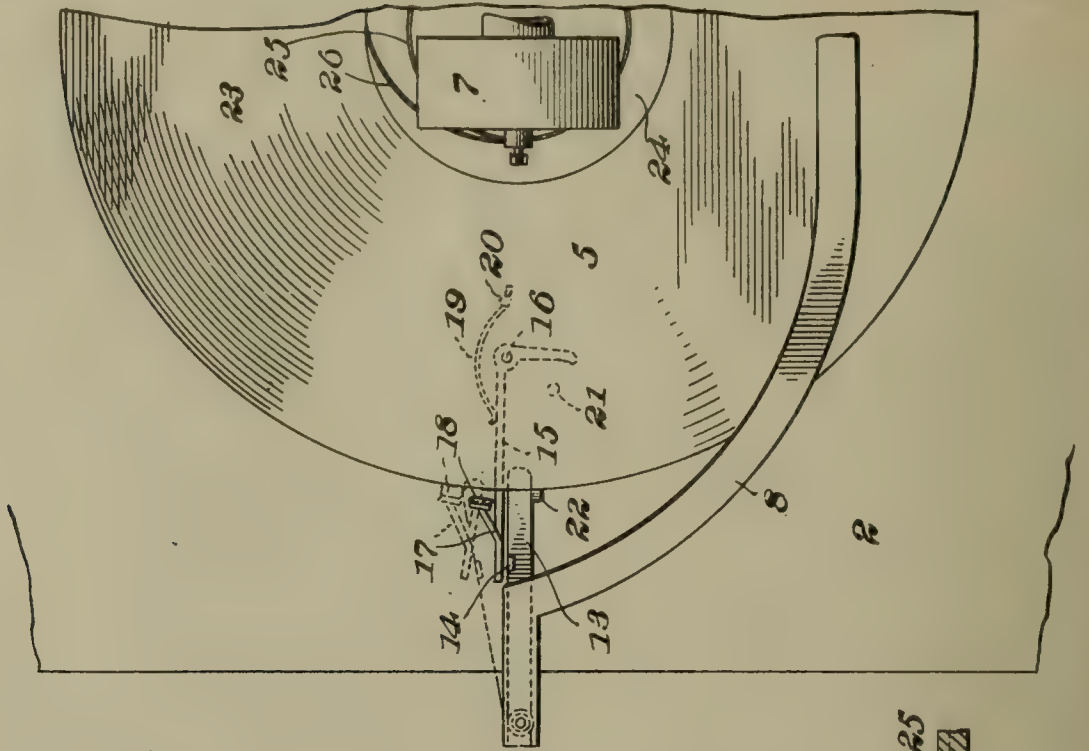


Fig. 2.

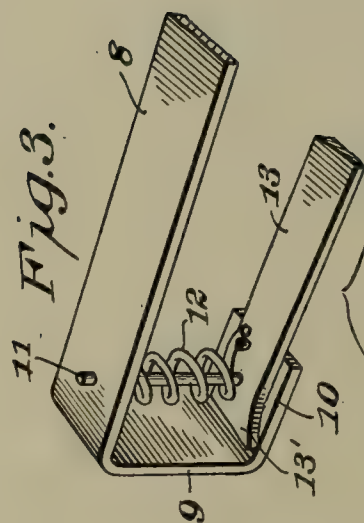


Fig. 3.

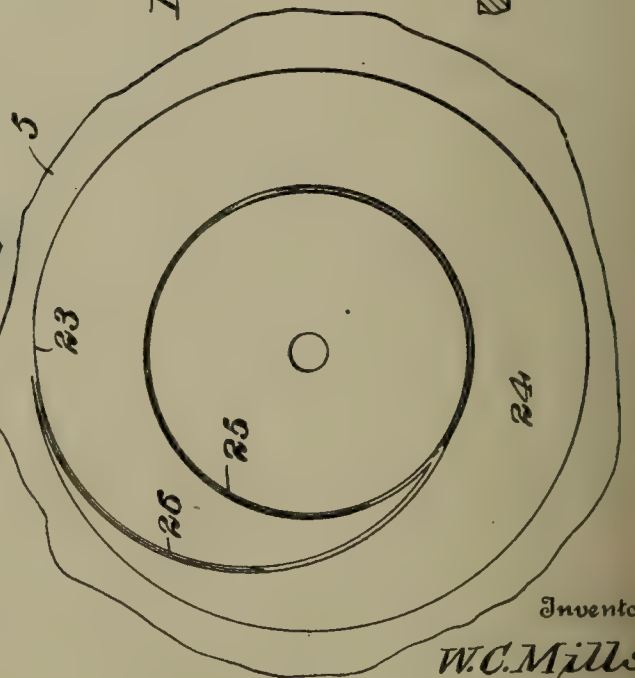


Fig. 4.



Fig. 5.

Witnesses
 W. S. Hoadson,
 Juana M. Tallin,

By

W. A. Macey,

Attorneys.

Inventor
 W. C. Mills,

UNITED STATES PATENT OFFICE.

WILBER C. MILLS, OF DENVER, COLORADO.

AUTOMATIC BRAKE FOR PHONOGRAPHS.

957,570.

Specification of Letters Patent.

Patented May 10, 1910.

Application filed May 28, 1909. Serial No. 498,831.

To all whom it may concern:

Be it known that I, WILBER C. MILLS, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Automatic Brakes for Phonographs, of which the following is a specification.

My invention relates to phonographs of the disk type and more particularly to an automatic brake mechanism therefor which is actuated primarily by the record disk acting upon the stylus of the sound box and through the stylus upon the sound box carrying arm and the brake mechanism hereafter described.

The object of my invention is to provide a brake mechanism which will be actuated when the record has been entirely played through and which will be automatically actuated no matter whether the record be long or short, and the invention includes in its general features, a brake mechanism attached to the sound box carrying arm and adapted as the arm moves inward to come nearer and nearer to the revolving periphery of the record supporting table and a disk record having thereon a tangential groove located interiorly of the record grooves, which, when the record has been entirely played, will guide the stylus inward toward the center of the record disk and will thereby carry in the same direction the sound box arm and the brake mechanism, so as to bring it in contact with the periphery of the revolving table and there check the speed of the machine.

For a full understanding of the invention and the merits thereof and also to acquire a knowledge of the details of construction, reference is to be had to the following description and accompanying drawings, in which:

Figure 1 is a side elevation of a sound reproducing machine with my brake mechanism thereon; Fig. 2 is a fragmental plan view of the same; Fig. 3 is a fragmental perspective view of the outer end of arm 8 and the lever 13; Fig. 4 is an enlarged fragmental plan view of the record disk made in accordance with my invention; Fig. 5 is a fragmental section of the record disk.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

Referring to the drawings, the numeral 2 indicates the supporting casing of any form of phonograph, gramophone, or like construction, 3 designating the spindle of the revolving table, and 4 the table itself upon which the record disk 5 is supported. This record disk is of a peculiar construction, to be hereafter stated. 6 designates the swinging arm which carries the sound box 7 and which swings diametrically across the disk, being moved from the circumference of the disk inward by the spiral record grooves. All this is the usual construction in this type of sound reproducing machines.

To the sound box carrying arm 6 is attached in any desired way a transversely extending and downwardly inclined arm 8. This arm is preferably curved, so that its end will come immediately opposite the stylus of the sound box, as will be seen from Fig. 2. The arm at this point is downwardly bent, as at 9, to form a housing, the extremity of the downwardly bent end being provided with an inwardly projecting lug 10. A pintle 11 passes through the arm and lug 10 and is provided with a coil spring 12 surrounding the pintle and acting to turn it. Upon the extremity of the pintle is carried an arm 13 which extends inward beyond the curved portion of the arm 8 and is formed with an upwardly projecting stud 14. The base of this arm or finger 13 is widened, as at 13', so as to form a stop preventing the finger 13 from being thrown inward beyond the point shown in Fig. 2.

Mounted upon the casing 2 beneath the rotatable table 4 is a bell crank-shaped arm 15 which is pivoted upon a pin 16. One end of this arm extends out beyond the periphery of the table 4, and this extended portion is provided with a projecting lug 17 carrying a brake shoe, which, when the arm 15 is turned in the direction of movement of the rotatable table 4, will contact with the periphery of the table and act to stop or check its movement. A spring 19 fast at one end of a pin 20 engages with the arm 15 and holds it in such position that the brake shoe is away from the periphery of the table. A stop 21 limits the movement of the arm in this direction. The lug 14 on the finger 13 is so arranged that it will contact with the projecting end of the arm 15 when the sound box is moved to a central position on the record. Depending from the edge of the table 4 either vertically downward or at an

inclination to the vertical is a lug 22 which will engage with the inner extremity of the finger 13 when the sound box has moved to its innermost position and carried the finger 13 to its innermost position. When this occurs the finger 13 will be turned upon its pivot by the continued rotation of the lug 22 with the table and will turn the arm 15 upon its pivot bringing the brake shoe 18 into contact with the periphery of the table and checking the movement thereof.

For the purpose of causing a positive inward movement of the sound box which will bring the brake mechanism carried by the arm 8 into contact with the periphery of the table, I provide a record disk of the form shown in Fig. 4. This disk has upon it the usual record grooves 23 which usually surround an inner plane portion 24. 26 designates a groove which connects with the last of the record grooves at the termination thereof and leads inward at a greater pitch than the record grooves and connects with a circular groove 25. With a record of this kind, when the stylus has reached the innermost or last groove of the record grooves, it will contact with the groove 26 and will be switched off toward the center of the record, thus giving a quick equal inward movement of the sound box, the arm 6, the arm 8, and the mechanism carried by the arm 8, so as to bring the finger 13 inward toward the periphery of the rotatable table where it may be engaged by the lug 22. After the stylus has passed along the groove 26 it will pass into the groove 25 and this will hold it in its innermost position until the speed of the rotatable table has been checked. It may be remarked that in some forms of phonographs of this type wherein it is necessary to raise the arm 6 in order to readjust the sound box, the lug 22 projects downward and outward at an inclination to the vertical, but in those phonographs wherein the arm 6 does not have to be raised to readjust the stylus, the lug extends directly downward from the bottom of the rotatable table. My device is capable of being adapted to either of these forms, and I do not wish to limit myself to the use of the table having a lug of any particular shape.

It will be seen that my invention provides a means whereby the rotation of the table 4 and the record may be checked automatically without regard to whether the record is long or short. As soon as the end of the record is reached, the stylus will be guided off upon the groove 26 and draw the sound box and the brake mechanism toward the center of the table, thus breaking the motion of the table. It will be seen that until the record has finished it is impossible for the brake mechanism to act, but that when it is finished it acts immediately and automatically.

While I have shown a particular form of

brake mechanism which I have found in practice to be very satisfactory, I do not wish to be limited to this, as it is obvious that other brake mechanisms operating upon the same principle, might be used in conjunction with my record disk, and that various modifications might be made in the details of construction without interfering with the principle of my invention.

Having thus described the invention what is claimed as new is:

1. In a sound-reproducing machine, the combination with a rotatable record support, a reproducer and a reproducer-carrying arm, of a brake shoe mounted adjacent to the periphery of the support and movable into contact therewith, but resiliently held out therefrom, an arm engagable with the brake shoe and moving it into contact with the record support, but normally held out of engagement with the brake shoe and a member on the support, engageable with the arm to move it into contact with the brake shoe when the reproducer and reproducer-carrying arm have passed entirely across the record, to thereby force the brake shoe into contact with the record support.

2. In a sound-reproducing machine, the combination with a rotatable record support having a stud projecting out therefrom, a reproducer, and a reproducer supporting arm, of a brake shoe, an arm carrying the brake shoe and pivoted beneath the record support to turn in the direction of movement thereof, but having a shorter radius than the support, a spring holding the arm in such position that the brake shoe is out of contact with the record support, and means carried by the reproducer supporting arm engageable by said stop on the record support, and when so engaged, movable into engagement with the brake shoe-carrying arm to bring it into contact with the record support.

3. In a sound reproducing machine, the combination with a rotatable record support, a reproducer, and a reproducer supporting arm, of a brake shoe, a carrying arm therefor pivoted to turn in the direction of movement of the record, but having a shorter radius than the record support, and means movable by the record support for forcing the brake shoe against the record support, when the reproducer arm has been moved to its innermost extreme position.

4. In a sound reproducer machine, the combination with a rotatable record support, a reproducer and a reproducer supporting arm, of a brake shoe, a carrying arm therefor pivoted to turn in the direction of movement of the record, but having a shorter radius than the same, a support projecting from the reproducer arm, a finger pivoted to said support and projecting toward the record support, said finger being

arranged to contact with the brake shoe supporting arm when the reproducer arm has been moved to its extreme innermost position, and means carried by the record support adapted to contact with said finger and move the finger in the direction of movement of the record support to engage the finger with the brake shoe supporting arm and move the said shoe into contact with the record support.

5. In a sound reproducing machine, the combination with a rotatable record supporting table, a reproducer having a stylus engaging with the grooves of a record, and an arm carrying said reproducer, of an arm supported at right-angles from the reproducer arm, a pivoted finger on the extremity

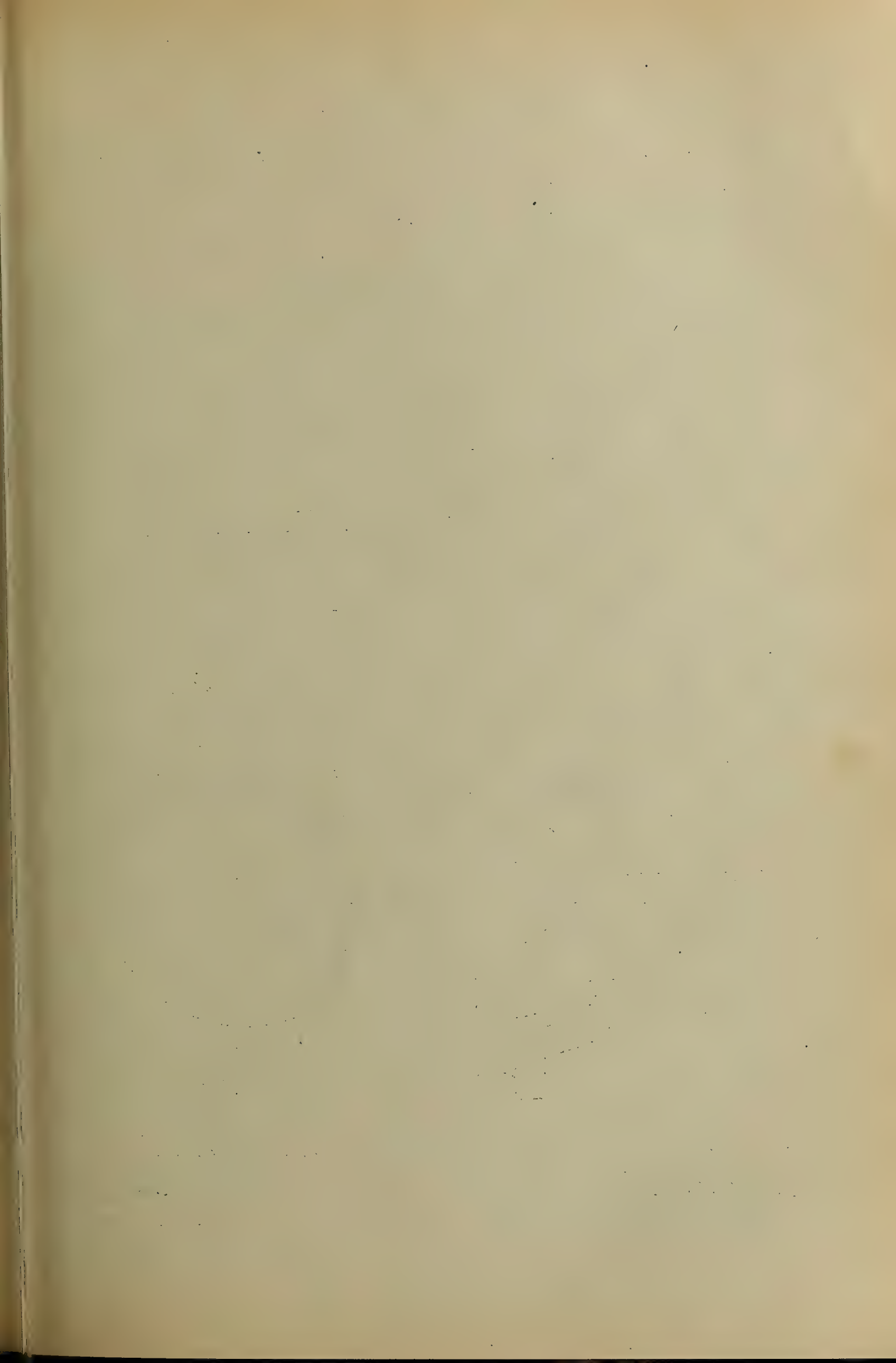
of said arm projecting inward toward the record table, a lug on the circumference of the record table adapted to contact with the pivoted finger when the finger carrying arm has been moved inward to its extreme point toward the table, and a brake shoe carrying arm pivoted beneath the table and adapted to be engaged by said finger and turned to bring the brake shoe into contact with the rotatable table when the finger is engaged by the lug thereon.

In testimony whereof I affix my signature in presence of two witnesses.

WILBER C. MILLS. [L. S.]

Witnesses:

JAMES C. HAMPSON,
MAX H. METZNER.



W. A. CHAPMAN.
 REVERBERATORY SOUND HORN.
 APPLICATION FILED JULY 10, 1908.

957,654.

Patented May 10, 1910.

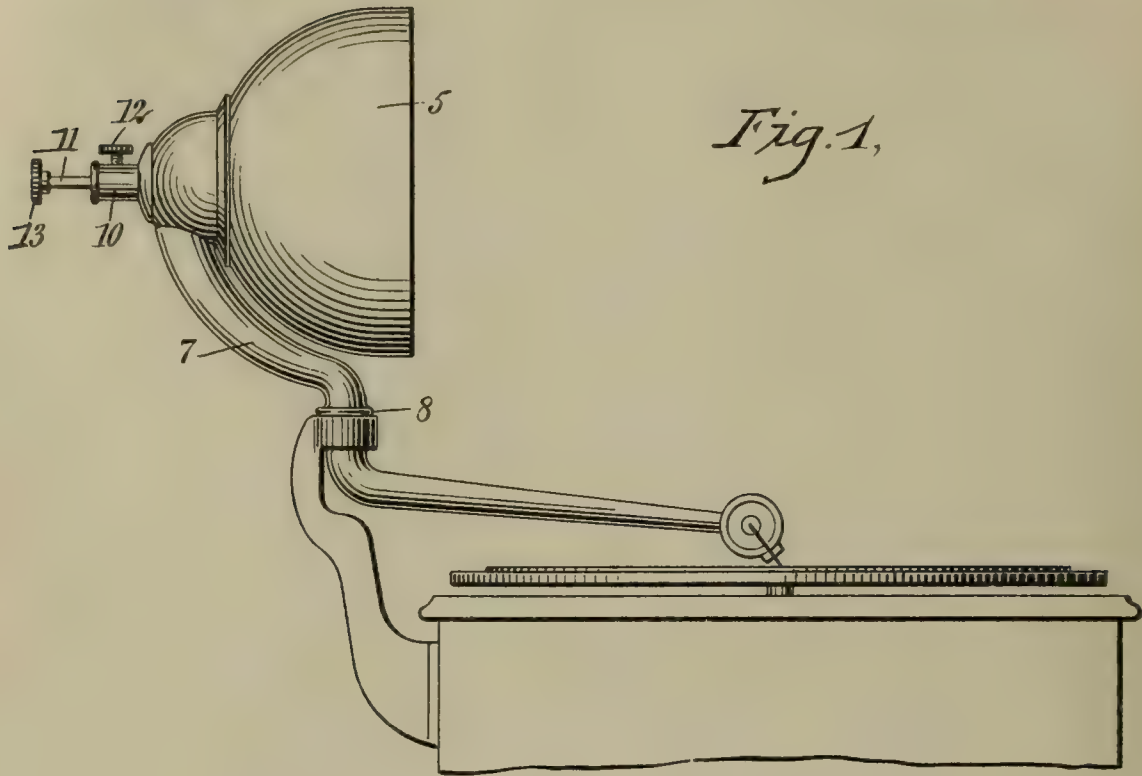


Fig. 1,

Fig. 2,

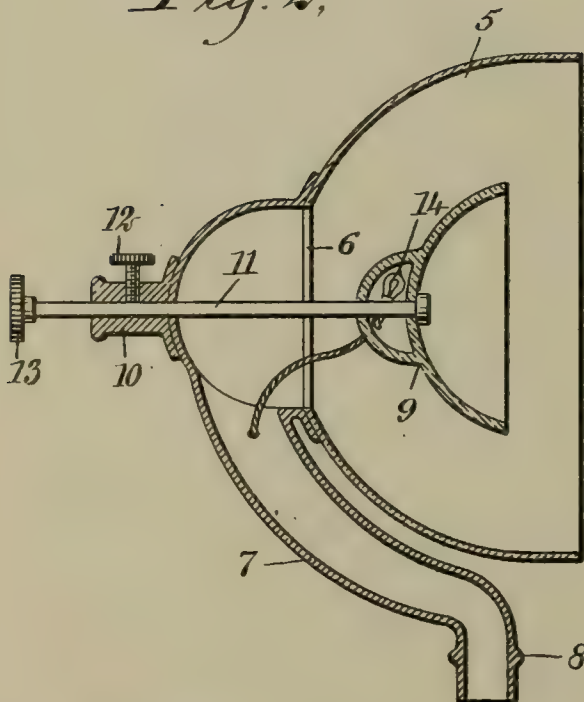
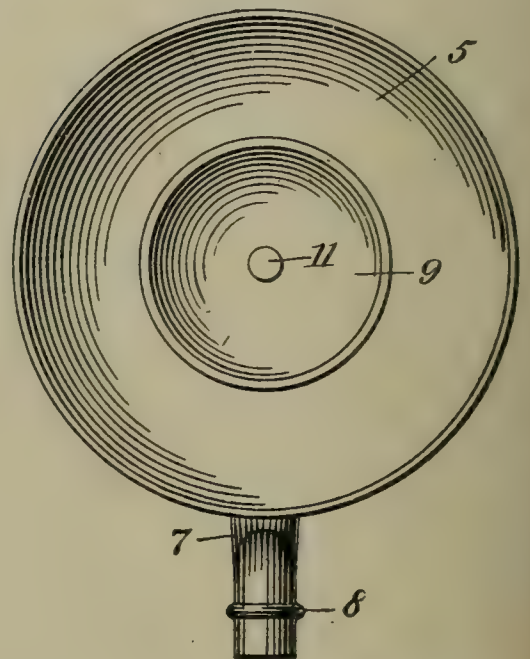


Fig. 3.



WITNESSES

Edward Thorpe
W. W. Fols

INVENTOR

William Albert Chapman
 BY *Munn & Co.*

ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM ALBERT CHAPMAN, OF SMITHVILLE, ARKANSAS.

REVERBERATORY SOUND-HORN.

957,654.

Specification of Letters Patent.

Patented May 10, 1910.

Application filed July 10, 1908. Serial No. 442,857.

To all whom it may concern:

Be it known that I, WILLIAM ALBERT CHAPMAN, a citizen of the United States, and a resident of Smithville, in the county of Lawrence and State of Arkansas, have invented a new and Improved Reverberatory Sound-Horn, of which the following is a full, clear, and exact description.

In the use of the ordinary trumpet-shaped metallic horn for the production of sounds, either of speech or musical notes, I have observed that in addition to the existence of the fixed ratio between the size of the horn and the sound volume, there is also an attendant tone pitch that is inherent in and peculiar to horns of such form and material. This tone pitch is quite pronounced, and varies with the shape and size of the horn and in horns of like size and shape, such as are composed of several pieces, which, in the joining, are often forced together, placing each piece under tension or strain varying both in direction and in intensity in the several members. This condition attaches to and colors every tone of the reproduction, imparting to each musical tone a false shading, often rendering it shrill, tremulous and metallic, and, again, harsh, grating and rattling, changing the notes of the piano to discordant cries and those of a violin to flute-like tones; characteristic peculiarities of the individual's speech are lost and strange effects introduced. Such discords are in part due to the kind and state of the material employed, and in part to the shape of the completed horn, which, if in trumpet form, enforces a constriction or concentration of tones and a blast or megaphone-like delivery, carrying with it the false sound waves of irregular depth and measure that are developed by the secondary vibrations of the unequally disposed parts of the horn. If the horn be small, shrillness, lack of body and expression in the tones of reproduction are its characteristics, while if the horn be large the tones are more pleasing by reason of being of greater depth and more sonorous, covering so to speak the defects observant in the small horn. Many disadvantages incident to the use of the large horn are such as its bulky form, insecure fastening and the room it occupies, which, together with its long leverage on the support, is a prolific source of accident. In my investigations I have found that the modification of the form of the horn may not

only be made effective in the reduction of size and length, but also to preclude the generation of false vibratory notes, and at the same time effect the delivery of voice tones natural to the speaker and musical tones of full volume and true value in tone coloring and expression. I have further found that certain materials lend themselves to the reproduction of sounds more perfectly than others, the vibrative sound thereof being in itself harmonious, full and low in effect, reinforcing the reproduced musical sounds. Of such materials I have found that certain specially prepared woods, glass, porcelain, papier-mâché, well lacquered and formed under heavy pressure are among the best; silver, aluminum, brass and copper spun into form and specially prepared are also well adapted to the purpose.

In the manufacture of this invention I prefer the bell or resonator made of opalescent glass or porcelain, and the reflector, of like material but of solid color, the material being superior and affording opportunity to secure the novel and beautiful effects that are varied and highly ornamental by means of reflected light. In the practical production of this invention the materials that may be used successfully, differ in degree and tone of resonance and may be further varied in character by slight change in form and arrangement of parts, as it is evident that such modifications are inherent in the act of manufacture and may be made to embody the essential characteristics of my improvement as defined in the claims hereinafter annexed.

The invention enables the manufacture of sound amplifiers as used in connection with talking machines, to be effected at a reduced cost; provides a new and novel means of increasing the artistic attractions of the room through the action of light, a reduction in the size of the horn heretofore required for the attainment of the given volume of sound, the control of the volume and tone of the sound commensurate with the size of the room in which it is placed, the elimination of all harsh and discordant notes, which are rendered true, full, resonant and in a natural manner; prevent the mingling of reproduced sounds with those of the source of which is external, and affords a self-contained and perfectly balanced amplifying horn for sound reproducing machines.

Having thus in general terms described the defects existing in sound amplifying devices as now used, to the removal of which and the attainment of superior results, this invention is designed, I will now by reference to the drawings, wherein like numerals designate like parts, describe the invention.

Figure 1 is a fragmentary view of a sound reproducing machine having my improved reverberatory sound horn applied thereto in its preferred embodiment; Fig. 2 is a central vertical section through the horn; and Fig. 3 is a face view of the same.

The preferable construction of my improved horn involves the use of a resonator 5, in the form of a hemispherical body slightly deeper than half its diameter and constructed of glass, porcelain, wood or other suitable resonant material, of uniform density and thickness, provided with a circular central opening 6 in its inner end or bottom for the passage of sound waves, and, further, where such body is of glass or porcelain, with a flange for connecting it to a sound tube 7. This sound tube 7 is in the nature of a metallic arm of gradually increasing size, and curved to conform with the curvature of the resonator 5 and effecting its placement well back of the machine, as illustrated in Fig. 1. The tube 1 serves the dual purpose of a support for the resonator, and a sound tube, and since it is securely and firmly united thereto it is in effect the same as one piece. The lower end of the tube 7 is designed to fit snugly into the socket provided for horns in the horn support of the machine, and is limited in its passage therein by a bead 8, arranged externally of the tube a suitable distance above its extremity. At the junction of the tube is a bell-shaped resonator; the former curves inwardly in the form of a hemisphere having its center at or near the center of the opening 6, and serves for the deflection of the sound waves directly through this opening against the face of a reflector 9 arranged in the resonator 5, and movably opposed to their free passage. On the rear face of the hemispherical end of the tube is secured, by making as an integral part or otherwise affixing, a boss 10, the bore of which is in exact alinement with the center of the resonator 5, in which is slidable a rod or stem 11 adapted to be secured in adjusted position by suitable means, such as a set-screw 12 threaded through the boss 10. The inner end of the rod 11 extends within the resonator where it supports the sound reflecting device 9, through which the adjustment of the latter is effected, the stem 11 being provided with a knob 13 at its rear end for this purpose. By reason of the particular mounting of the stem 11 and the association of the reflector therewith, the latter is supported centrally within the resonator and out of

contact with any part thereof. By this construction the relative position of the tube reflector, the movable reflector or reverberatory lens and the resonator changes the angles at which the sound waves impinge, for the alteration of the sound volume as well as otherwise modifying the tone.

The form adopted for the reflector is, as clearly shown in Fig. 2, an outer hemisphere having an inner hemisphere superposed on its bottom or rear face, the two being constructed of one piece and of a weight sufficient to prevent as far as possible all vibration. Within the smaller hemisphere is placed a small electric bulb 14, which is backed by foil attached to that part of the larger hemisphere and covering that portion of the smaller one. The conductors to the light, which ordinarily connect with a small battery, pass through the rear or bottom side of the smaller sphere at suitable points. While light forms a valuable addition to my improvement, it is nevertheless in no wise essential as regards efficiency in sound reproduction, and may be dispensed with if desired, the sole purpose being simply to obtain the attractive play of the changeable and iridescent light reflected from the vibrating surfaces of the resonator. Resonance is a desirable feature in the resonator 5, and is provided for in the selection of the material, the thickness and evenness of the walls, the form and depth of the resonator and its prevention of contact at any point other than that at the joint made with the tube.

In the reflector or reverberatory lens, neither resonance nor vibration is desired, its province being the deflection of sound waves issuing from the mouth of the tube against the walls of the resonator, there to be thrown forward in parallel lines. As these sound waves issue through the sound tube 7, they pass in parallel lines against the reflecting face of the reflector and by it are spread over the back interior face of the resonator, which in turn delivers them outwardly in parallel lines.

Having thus described my invention, I claim as new and desire to secure by Letter Patent:

1. The combination of a resonator having a sound-conveying tube leading thereto, and a hollow sound reflector supported within and spaced from the resonator, with the discharge ends of the tube and resonator facing in the same direction and the tube discharging into the space between the resonator and reflector.

2. The combination of a resonator having a sound-conveying tube leading thereto, and a sound reflector supported in the resonator and movable forwardly and rearwardly therein to and from the tube forward of the discharge end thereof.

3. The combination of an approximately hemispherical resonator having an opening in the bottom, and a sound tube intermediate its length, conforming to the curvature of the resonator and having a substantially hemispherical extremity attached to the resonator over said opening.

4. The combination of a horn for sound reproducing machines, of opalescent material, and a combined sound and light reflector of like material arranged within the horn.

5. The combination of a resonator, a sound tube leading to and attached to the resonator, and a reflector within the resonator, adjustably supported on the tube, with the tube discharging externally of the resonator.

6. The combination of a resonator, and a reflector consisting of two hemispheres imposed one on the other, arranged in the resonator, with the enlarged ends of the hemispheres facing outwardly.

7. The combination of a resonator, and a reflector within the resonator comprising a hemisphere having a smaller hemisphere imposed thereon, with the resonator and hemispheres facing in the same direction.

8. The combination of a resonator, a sound-conveying tube leading to and connected with the resonator, a stem slidable through the rear wall of the tube in substantial axial alinement with the resonator, and a reflector carried on the stem.

9. The combination of a resonator, a tube leading to and connected with the resonator and provided with a boss, a stem slidable through the boss and tube in axial alinement with the resonator, a reflector carried on the stem, and a set-screw threaded through the boss adapted to bind on the stem and secure the reflector in adjusted position.

10. The combination of a resonator, a sound-conveying tube leading to the resonator, and a reflector supported within and isolated from the walls of the resonator, having the rear external face thereof opposed to the discharge end of the tube.

11. The combination of a hemispherical resonator provided with an opening, and a sound tube having an approximately hemispherical portion connecting the resonator over said opening.

12. The combination of a resonator comprising two approximately hemispherical

bodies of different size with the smaller body discharging into the rear of the larger body, and a sound tube leading to the smaller body.

13. A sound-transmitting tube having an approximately hemispherical resonator in which it discharges, and a reflector supported in advance of the resonator to intercept the sound waves after the latter have first passed from the tube into the resonator.

14. The combination of a resonator consisting of a hemispherical body imposed upon by a body of like form, and a reflector of a form corresponding to the shape of the resonator and arranged therein.

15. The combination of a sound-transmission tube, a reflector arranged at the front of the discharge end of the tube to externally intercept the sound waves, and a resonator surrounding the reflector and isolated therefrom, forming an annular passage for the escape of the sound waves from the tube.

16. The combination of a resonator through which light is adapted to pass, a reflector arranged within the resonator consisting of two hemispherical bodies of different size, and a light arranged within the smaller body.

17. The combination of an approximately hemispherical resonator having an opening in the curved wall thereof, and a sound tube leading to the resonator, having an approximately hemispherical discharge end relatively smaller than the resonator and communicating therewith through said opening.

18. The combination of a resonator constructed of a material penetrable by light, a reflector within the resonator, having a light, and means to move the reflector relatively to the resonator to produce variable light and tone effects.

19. The combination of a resonator of a material penetrable by the light, a combined sound and light reflector supported within the resonator, and a light supported adjacent to the reflector.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM ALBERT CHAPMAN.

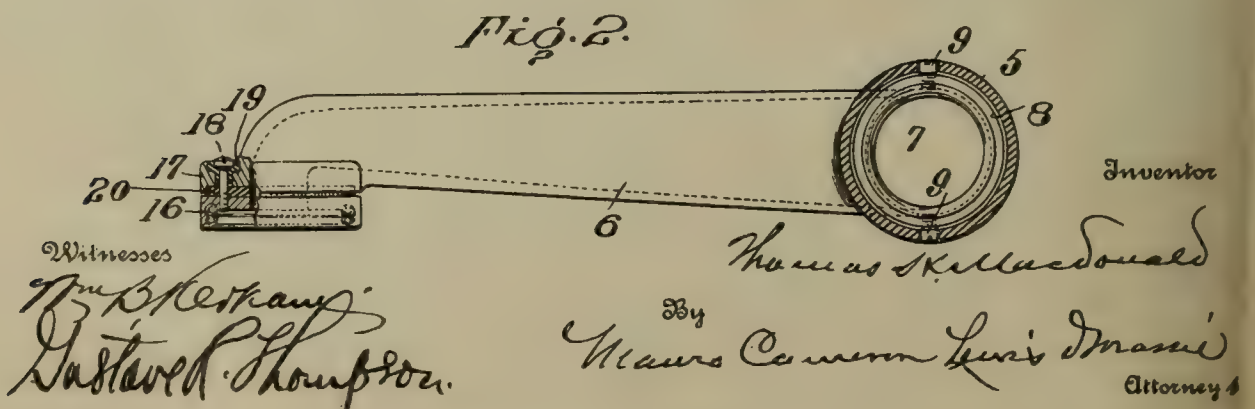
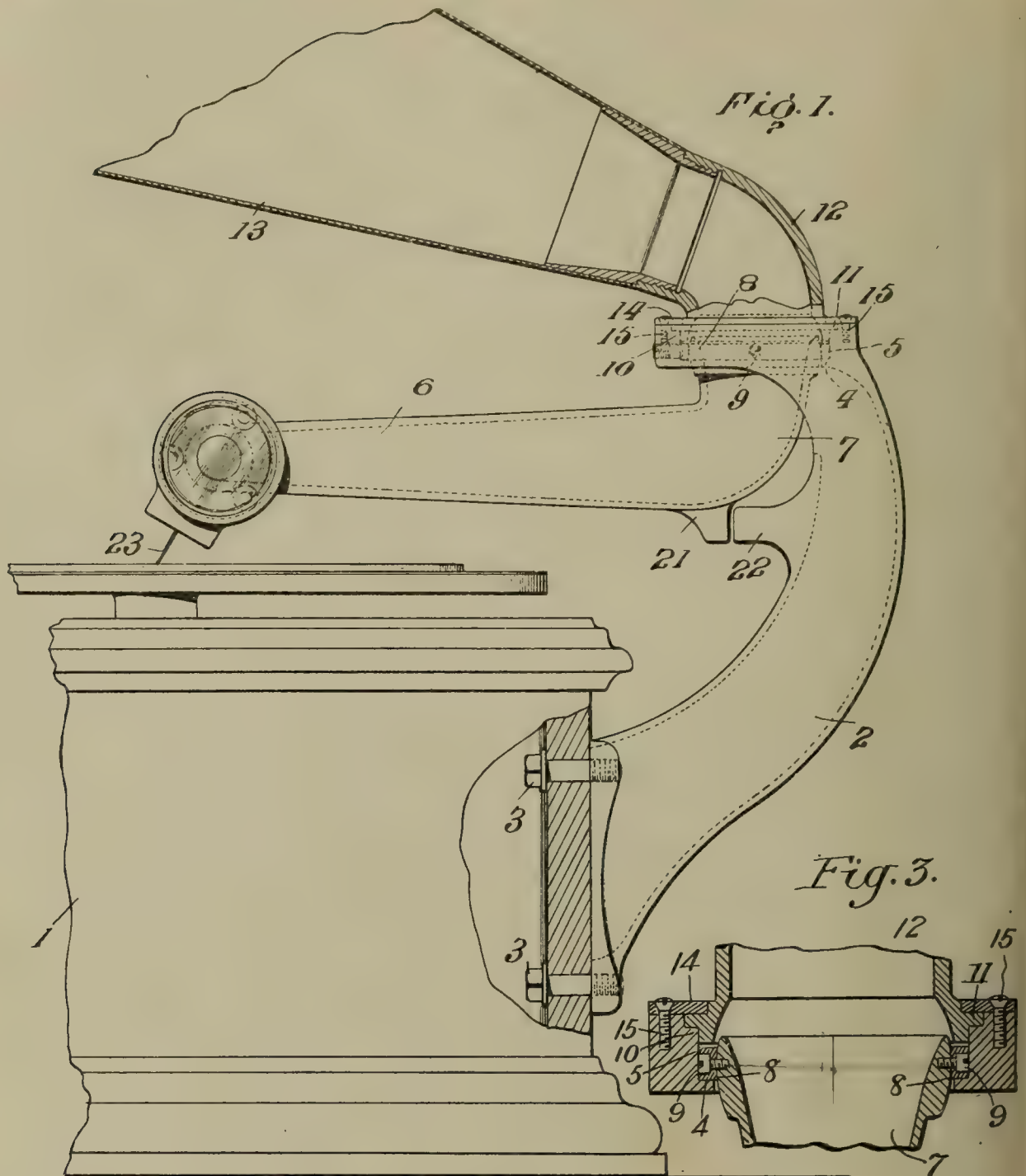
Witnesses:

H. C. STEADMAN,
D. H. KAISER.

T. H. MACDONALD.
DISK SOUND REPRODUCING MACHINE.
APPLICATION FILED MAY 23, 1905.

957,694.

Patented May 10, 1910.



UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO AMERICAN GRAPHOPHONE COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF WEST VIRGINIA.

DISK SOUND-REPRODUCING MACHINE.

957,694.

Specification of Letters Patent.

Patented May 10, 1910.

Application filed May 23, 1905. Serial No. 261,892.

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, a resident of Bridgeport, Connecticut, have invented a new and useful Improvement in Disk Sound-Reproducing Machines, which invention is fully set forth in the following specification.

This invention relates to talking machines, and more particularly to the class known as "disk" machines, in which the reproducer is carried on the end of a swinging arm which is capable of moving transversely across the face of the record during the act of reproduction.

The object of the invention is to provide a construction of swinging arm which shall readily respond in a vertical direction to any irregularities in the surface of the tablet and at the same time be capable of freely moving transversely across the face of the record without the necessity of carrying or moving the usual horn, and at the same time be capable of transmitting the sound vibrations from the hollow swinging arm to the horn without loss or modification due to an imperfect or incomplete union between the swinging arm, which moves and the horn, which, during the act of reproduction, is stationary.

Moreover the invention has for its object to provide a construction wherein the horn may be readily turned so as to direct the great volume of the sound in any desired direction without the necessity of moving the machine, and furthermore of attaching the reproducer to the hollow swinging arm in such a way as to avoid the loss of sound vibrations or modifications thereof through the introduction of false vibrations.

With this object in view the invention consists of the usual stationary supporting arm attached in any suitable manner to the machine casing, which supporting arm is provided with an annular ledge upon which rests a ring, free to turn in a horizontal plane on the ledge, the interior face of the ring being cut on the lines of a sphere whose center is the center of the ring, combined with a hollow reproducing arm having a spherical end of bearing fitting snugly within the spherical portion of the ring and capable of rocking in a vertical plane about trunnions passing through the ring and into the spherical portion of the swinging arm.

Furthermore, the invention consists in providing a flange on the base of the horn which rests on a suitable annular ledge in the stationary supporting arm, said flange being engaged on its upper side by a clamping ring secured to the stationary supporting arm by screws or other suitable devices, the entire joint between the horn, the stationary arm, the ring and the hollow swinging arm being treated with a non-fluid lubricant, such as petroleum jelly or the like, whereby the joint is not only lubricated but is also rendered air-tight, to the end that the sound vibrations are fully and completely transmitted from the hollow arm to the horn without any escape or diminution thereof.

The invention is illustrated in the accompanying drawings, which show one mechanical expression of the inventive idea, in which drawings—

Figure 1 is a broken side elevation, partly in section; and Fig. 2 is a plan view of the hollow swinging arm, showing the ring and the trunnions connecting said ring to the hollow arm, in horizontal section; and Fig. 3 is a vertical section through the upper end of the swinging arm and the lower end of the stationary arm, illustrating the mounting of said arms.

Referring to the drawings, 1 indicates the usual framework of the machine, and 2 is the usual or any suitable stationary arm secured to said framework by any suitable means, as by bolts 3. The upper end of the arm 2 is annular in form and has formed on the interior thereof an annular ledge 4 upon which rests a ring 5, the interior of the ring corresponding to the zone of a sphere whose center is the center of the ring 5. The swinging arm 6 is hollow, as is usual in arms of this character, and has its outer end formed in the shape of an elbow 7, the exterior surface of the upper end of the arm having a spherical surface 8 corresponding with the interior spherical surface of the ring 5, and fitting snugly therein. Trunnions 9—9, preferably in the form of screws, are passed through the ring 5 into the material of the spherical portion of the hollow arm, said trunnions 9—9 being diametrically opposite each other and forming centers about which the hollow arm 6 may be rocked in a vertical plane, the arm at the same time

being capable of revolving in a horizontal plane carrying the ring 5 with it, which moves upon the bearing ledge 4. Immediately above the ring 5 is an annular ledge 10 of somewhat greater diameter than the ledge 4, upon which rests the flange 11 of the base portion 12 of the horn 13, the same being held in position by means of a clamping ring 14 secured by screws 15 passing into the body of the stationary arm 2, the interior diameter of the ring 14 being less than the exterior diameter of the flange on the horn. The horn is retained in position on said stationary arm by said clamping ring 14 while at the same time being free to entirely revolve in a horizontal plane so as to direct the open end of the horn in any direction without moving the casing 1 of the machine.

Referring to Fig. 2, 16 is the usual or any suitable reproducer head which is secured to the flange 17 on the end of the swinging arm by any suitable means, as by screws 18, which are insulated from the metal of the flange 17 by rubber gaskets 19, an annular gasket 20 being interposed between the face of the flange 17 and the inner face of the reproducer head 16. By this means a perfectly closed joint between the inner face of the reproducer head and the face of the flange on the swinging arm is secured, and at the same time all danger of transmission of foreign vibrations through the clamping screws 18 to the metal of the swinging arm and thence to the horn is avoided.

As before stated, the joint formed between the end of the swinging arm and the ring 5 is packed with a suitable non-fluid lubricant, as petroleum jelly, whereby the joint is perfectly sealed and at the same time friction avoided.

21 indicates a lug on the under side of the swinging arm 6, which is normally opposite to but out of engagement with a corresponding lug 22 on the stationary arm 2. When the reproducing needle 23 is removed from the reproducer, or whenever a record tablet is absent from the machine, the engagement of the lug 21 on the swinging arm with the lug 22 on the stationary arm acts to support the same and prevent it from resting upon the tablet or upon the tablet-holder.

It will be perceived that in the construction thus devised, there is provided a swinging arm which has great freedom of movement while at the same time there is no joint between said arm and its support which would in any way interfere with the accurate transmission of the sound vibrations, which latter are transmitted free from the introduction of foreign vibrations of any kind whatever. Moreover, it will be perceived that the horn itself has absolute freedom of movement in a horizontal plane, and that the method of securing the reproducer head to the end of the swinging arm is such

as to entirely avoid the introduction of foreign vibrations at this point.

What is claimed is:

1. In a talking machine, the combination of a stationary supporting arm having a horizontal annular ledge, a ring resting on said ledge and having its interior surface corresponding to a spherical zone whose center is the center of the ring, a hollow swinging arm carrying the reproducer at one end, the other end having its exterior surface in the form of a spherical zone fitting snugly within said ring, and diametrically opposite trunnions engaging said ring and hollow arm.

2. The combination of a swinging arm carrying the reproducer at one end, a ring within which the other end of the arm is joined on lines corresponding to a portion of the surface of a sphere, trunnions securing said ring and arm together, and a stationary arm supporting said ring.

3. The combination of a swinging arm carrying the reproducer at one end, a stationary arm, a ring mounted on said stationary arm to turn in a horizontal plane and trunnions connecting the ring to the swinging arm to permit said arm to turn in a vertical plane.

4. The combination of a stationary arm, a substantially horizontal hollow swinging arm having a vertically extending elbow at one end and a reproducer at the other end, a horizontal ring jointed to said elbow on spherical lines, trunnions also connecting said ring and elbow, and a stationary arm supporting said ring.

5. The combination of a stationary arm, a horn mounted thereon so as to be free to turn in a circle, a hollow swinging arm having a reproducer at one end, a ring connected to the other end by a spherical joint and a pair of trunnions and a horizontal bearing for said ring on the stationary arm.

6. The combination of a stationary arm having an annular ledge formed thereon, a ring resting on said ledge, a hollow swinging arm hinged to said ring, a second annular ledge on said stationary arm above the first mentioned ledge, a horn having a flanged base resting on said second ledge, and a clamping device engaging the flange on the horn securing it in position to be revolved on said second ledge.

7. In a talking machine the combination of a stationary and a swinging arm, a flexible joint between the two arms, and a non-fluid oil or lubricant sealing said joint.

8. The combination of a swinging arm carrying the reproducer at one end, a stationary arm having a circular opening provided with a circular bearing upon its inner wall, supporting means supported by and to turn upon said bearing and horizontal trunnions supported by said means and en-

gaging said swinging arm at its other end to permit vertical movement of said swinging arm.

9. In a talking machine the combination
5 with a sound conveying tube, a fixed support having a circular opening therein, a horizontal circular bearing provided upon one of said parts, circular supporting means for said tube conforming to said opening
10 and tube and engaging said bearing to support said tube and permit horizontal swinging movement of said tube and opposite horizontal trunnions supported by said fixed support to support said conveying tube and
15 to permit vertical swinging movement of said conveying tube.

10. The combination of a swinging arm carrying the reproducer at one end, a fixed support having a circular opening in which
20 the other end of said arm is situated, supporting means interposed between the end of the arm situated within said circular opening and said fixed support and movably engaging one of said parts to permit
25 the arm to turn in a horizontal plane, and a connection between said supporting means

and the other of said parts to permit said arm to turn in a vertical plane.

11. The combination of a swinging arm carrying the reproducer at one end, a fixed support having a circular opening in which the other end of said arm is situated, supporting means interposed between the end of the arm situated within said circular opening and said fixed support and movably
35 engaging one of said parts to permit the arm to turn in a horizontal plane, and trunnions connecting said supporting means with the other of said parts to permit said arm to turn in a vertical plane.

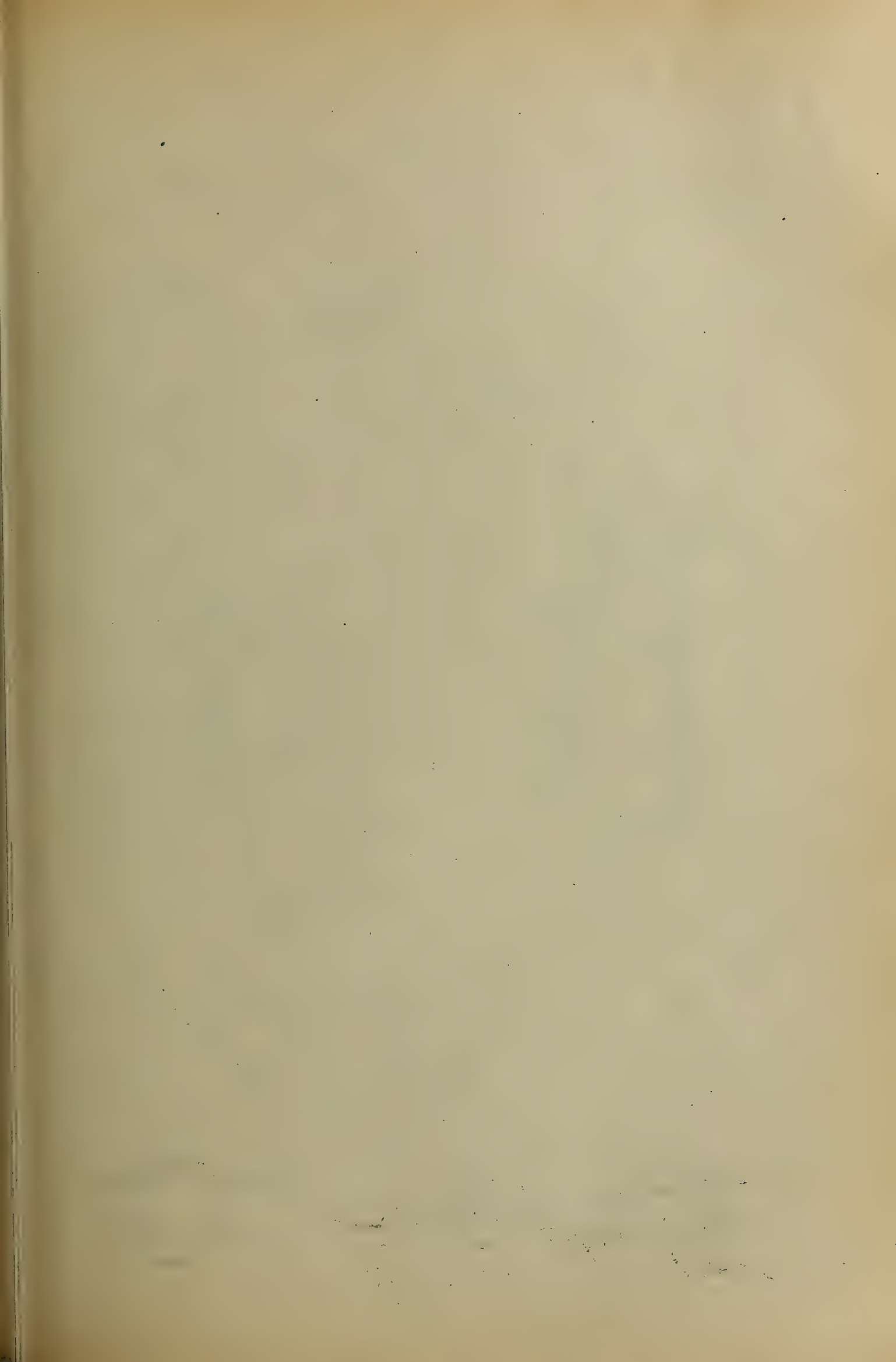
12. The combination of a swinging arm carrying the reproducer at one end, a stationary arm having a fixed support, and trunnions secured to the swinging arm and carried by the fixed support.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOS. H. MACDONALD.

Witnesses:

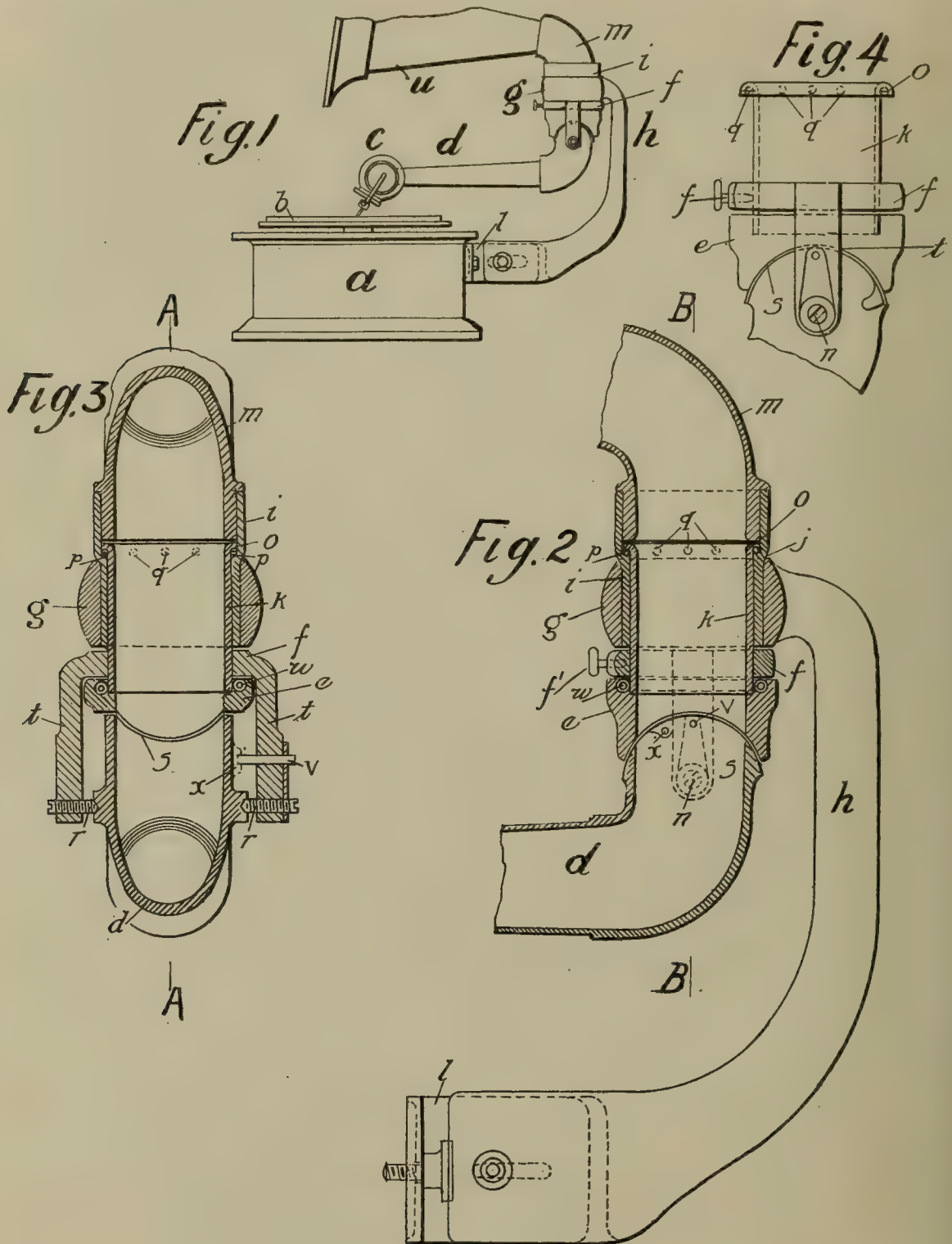
A. B. KEOUGH,
C. A. GIBNER.



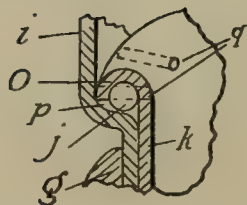
R. L. GIBSON.
SUPPORTING DEVICE FOR SOUND BOX ARMS AND HORNS OF TALKING MACHINES.
APPLICATION FILED DEC. 11, 1906.

958,109.

Patented May 17, 1910.



WITNESSES:
F. B. Barry
Alexander Clark



INVENTOR
Robert L. Gibson
BY
John P. ...
ATTORNEY.

UNITED STATES PATENT OFFICE.

ROBERT L. GIBSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SUPPORTING DEVICE FOR SOUND-BOX ARMS AND HORNS OF TALKING-MACHINES.

958,109.

Specification of Letters Patent.

Patented May 17, 1910.

Application filed December 11, 1905. Serial No. 291,197.

To all whom it may concern:

Be it known that I, ROBERT L. GIBSON, a citizen of the United States, and a resident of Philadelphia, State of Pennsylvania, have
5 invented certain new and useful Improvements in Supporting Devices for Sound-Box Arms and Horns of Talking-Machines, of which the following is a full, clear, and complete disclosure.

10 More particularly my improvements relate to the devices for supporting the hollow sound-box carrying arm and horn in the bracket secured to the case of a talking machine.

15 It is my object to provide a simple and efficient construction by which the support of the sound-box carrying arm in proper position is assured notwithstanding irregularities in the bracket due to springing of the
20 bracket arms or other causes. This object I accomplish by supporting the sound box carrying arm wholly in the upper free end of the bracket on both a vertical and horizontal axis by means of a rotary sleeve supported
25 on ball bearings in a socket on the bracket, and carrying a ring piece at its lower end, in which the sound box carrying arm is mounted on horizontal pivots. The arm is thus supported by the bracket wholly from the
30 top through the rotary sleeve, which, being mounted on ball bearings, may turn with very little friction. The ball bearings are formed by a series of balls supported on an annular shoulder in a sleeve carried by the
35 socket piece of the bracket, and engaged by a flange on the upper end of the rotary sleeve. The upper end of the sleeve carried by the bracket socket forms a socket-piece for the horn.

40 The construction is not only very efficient for the purposes intended, but is simple and inexpensive and the parts may be easily assembled or taken apart.

45 In the accompanying drawings, Figure 1 is a side elevation of a talking machine constructed in accordance with this invention; Fig. 2 an enlarged side elevation partly in vertical section on line A—A of Fig. 3, of a portion of the same; Fig. 3 a transverse
50 vertical section on line B—B of Fig. 2; Fig. 4 an enlarged fragmentary side elevation of a portion of the same; and Fig. 5 an enlarged fragmentary sectional perspective of a portion of the same.

55 Referring to the drawings, the case *a* of

the talking machine contains the motor which drives the turn-table or record support carrying the record *b*. A bracket *h* is adjustably secured at its lower end to an arm
60 *l* on the said case *a*, and is provided at its upper end with a tubular socket *g*, in which is fitted a tubular sleeve *i*. The upper part of the sleeve *i* receives the elbow *m* to which the horn *u* is secured.

The sleeve *i* is formed with an annular
65 offset or shoulder *j* on the inside below the elbow socket portion. Within the lower portion of the sleeve *i* is a sleeve *k*, which has its top turned over or flanged as at *o* to form with the annular offset or shoulder *j*
70 an annular socket or way for a series of balls *p*. The sleeve *k* is thus supported at the top on ball bearings within the sleeve *i* and may turn freely upon them. To prevent the
75 balls *p* becoming bunched together, pins *q* may be placed transversely through the flange *o* in the sleeve *k*.

The lower end of the sleeve *k* extends below the socket *g* and sleeve *i* and carries a ring
80 *f* which is secured by a set screw *f'*. This ring *f* has depending arms *t t* carrying pivots *r r*, in which is pivoted the head of the hollow arm *d* which carries sound box *c*. The head of the hollow arm is upturned and curved as at *s* from the pivots as centers,
85 and between this curved end and the ring *f* is interposed a tubular piece *e* having its under face complementary to and resting on the curved end *s*. The top of the tubular piece *e* receives the lower extremity of the
90 sleeve *k* and between the piece *e* and ring *f* is interposed a cushion *w* preferably of rubber tubing, which enables the piece *e* to yield slightly and thus prevents binding between
95 its lower curved edge and the curved edge *s* of the hollow arm. In this construction it will be observed that the hollow arm *d*, which carries the sound box *c*, is supported on the bracket wholly from the top on a
100 vertical axis formed by the ball bearings between the sleeve *k* and the sleeve *i*, on which it may turn freely with minimum friction. The arm *d* is also pivoted on a
105 horizontal axis formed by the pivots *r r* carried by the ring *f* secured to the rotary sleeve *k*. The hollow arm thus has both its horizontal and vertical axes formed in the upper free end of the bracket *h*, and, consequently, will not be so liable to be
110 thrown out of alinement by any irregular-

ity or springing of the bracket *h*, as if a rigid vertical axis were formed between the top of the bracket and its lower part.

The arm *d* may be rocked on the pivots *r r* to raise and lower the sound box. To secure the arm and sound box in raised position, while a record disk is being removed and replaced, a spring catch *v* may be carried by one of the arms *t* adapted to engage a notch or recess *x* on the upper end of the hollow arm.

What I claim as new and desire to secure by Letters Patent, is as follows:—

1. The combination with a bracket adapted to be attached at one end to the case of a talking machine, and having a tubular socket at its free end, a sleeve carried by said bracket-socket, and having its upper end formed as a socket to receive the horn, a rotary sleeve supported within said first sleeve and having its lower end projecting beyond the lower edge of the bracket-socket, a ring piece carried by said projecting end of the rotary sleeve, and a hollow sound box carrying arm mounted on horizontal pivots carried by said ring piece.

2. The combination with a bracket adapted to be attached at one end to the case of a talking machine, and having a tubular socket at its free end, a sleeve carried by said bracket-socket, and having its upper end formed as a socket to receive the horn, a rotary sleeve supported within said first sleeve and having its lower end projecting beyond the lower edge of the bracket-socket, a ring piece carried by said projecting end of the rotary sleeve, a hollow sound box carrying arm mounted on horizontal pivots carried by said ring piece, and having its end upturned and curved, and a tubular piece having a complementary curved lower edge interposed between the ring piece and the upturned curved end of the hollow arm.

3. The combination with a bracket adapted to be attached at one end to the case of a talking machine, and having a tubular socket at its free end, a sleeve carried by said bracket-socket, and having its upper end formed as a socket to receive the horn, a rotary sleeve supported within said first sleeve, and having its lower end projecting beyond the lower edge of the bracket-socket, a ring piece carried by said projecting end of the rotary sleeve, a hollow sound-box carrying arm mounted on horizontal pivots carried by said ring piece, and having its end upturned and curved, a tubular piece having a complementary curved lower edge interposed between the ring piece and the upturned curved end of the hollow arm, and a yielding cushion interposed between said tubular piece and ring piece.

4. The combination with a bracket adapted to be attached at one end to the case of a talking machine, and having a tubular

socket at its free end, a sleeve carried by said bracket-socket, and having its upper end formed as a socket to receive the horn a rotary sleeve supported within said first sleeve on ball bearings and having its lower end projecting beyond the lower edge of the bracket-socket, a ring piece carried by said projecting end of the rotary sleeve, and a hollow sound-box carrying arm mounted on horizontal pivots carried by said ring piece.

5. The combination with a bracket adapted to be attached at one end to the case of a talking machine, and having a tubular socket at its free end, a sleeve carried by said tubular socket and formed with an internal annular shoulder, a series of balls supported by said shoulder, a rotary sleeve within the first sleeve having its upper end provided with a flange engaging said balls, a ring piece carried by the lower end of said rotary sleeve, and a hollow sound-box carrying arm mounted on a horizontal axis carried by said ring piece.

6. The combination with a bracket adapted to be attached at one end to a fixed support and having a tubular socket at its free end, of a sleeve carried by said bracket socket, said sleeve being provided with an enlarged end forming a shoulder resting against said bracket, a horn rotatably mounted within said enlarged end, a rotary sleeve supported upon said shoulder within said first mentioned sleeve, and a sound conveying arm depending from said rotary sleeve.

7. The combination with a fixed support, of a bracket rigidly attached at one end to said support, and having a tubular socket at its free end, of a sleeve carried by said bracket socket, said sleeve being provided with an enlarged end forming a shoulder resting upon the top of said bracket, and a horn rotatably mounted within said enlarged end of said sleeve.

8. The combination with a bracket adapted to be attached at one end to a fixed support, and having a tubular socket at its free end, of a sleeve carried by said bracket socket, and having its upper end formed as a socket to receive the horn, and having an annular shoulder resting against said bracket, a rotary sleeve supported within said first mentioned sleeve, and having a flange, the upper end forming with said shoulder a raceway, anti-friction means between said shoulder and flange, and a sound conveying arm depending from said rotary sleeve.

9. In a talking machine, the combination with a hollow support, of a sleeve carried in said support, a sound amplifier carried by one end of said sleeve, a rotary sleeve supported within said first mentioned sleeve and having one end projecting outside of the other end of said first mentioned sleeve,

a ring piece carried by said projecting end of the rotary sleeve, and a hollow sound box arm carried by said ring piece.

10. In a talking machine, the combination with a hollow support, of a sleeve carried in said support, a sound amplifier carried by one end of said sleeve, a rotary sleeve supported within said first mentioned sleeve and having one end projecting outside of the other end of said first mentioned sleeve, a ring piece carried by said projecting end of the rotary sleeve, and a hollow sound box arm entirely supported by said ring piece.

11. In a talking machine, the combination with a support having a tubular socket, of a vertically arranged sleeve supported in said socket, a sound amplifier carried by the upper end of said sleeve, a rotary sleeve supported within said first mentioned sleeve and having its lower end projecting below the lower edge of said first mentioned sleeve, and a hollow sound box arm connected to and carried by said projecting end of said rotary sleeve.

12. In a talking machine, the combination with a support having a tubular socket, of a sleeve entirely supported by said socket, a rotary sleeve entirely supported from within said first mentioned sleeve and having one end projecting outside of said first mentioned sleeve, and a hollow sound box arm entirely supported by said projecting end of said rotary sleeve.

13. In a talking machine, the combination with a support having a tubular socket, of a sleeve carried by said socket, a rotary sleeve within said first mentioned sleeve, anti-friction rotary means between said sleeves, and a hollow sound box arm supported by said rotary sleeve.

14. In a talking machine, the combination with a support having a tubular socket, of a sleeve carried by said socket, a rotary sleeve supported within and entirely by said first mentioned sleeve, and a hollow sound box arm entirely supported by said rotary sleeve.

15. In a talking machine, the combination with a support having a tubular socket, of a sleeve fixed in said socket a sound amplifier carried by said sleeve, a rotary sleeve supported within and entirely by said first mentioned sleeve, and a hollow sound box arm entirely supported by said rotary sleeve.

16. In a talking machine, the combination with a support having a tubular socket, of a sleeve fixed in said socket a sound amplifier carried by said sleeve, a rotary sleeve supported within and entirely by said first mentioned sleeve, and a hollow sound box arm entirely supported by said rotary sleeve and movable with respect to said rotary sleeve.

17. In a talking machine, the combination with a support having a tubular socket, of a sleeve supported in said socket, a rotary sleeve supported within said first mentioned sleeve, and a hollow sound box arm carried by said rotary sleeve and rotatably adjustable with respect thereto.

18. In a talking machine, the combination with a support, having a tubular socket, of a sleeve supported in said socket, a rotary sleeve supported within and entirely by said first mentioned sleeve, and a hollow sound box arm pivoted to said rotary sleeve and rotatably adjustable with respect to said rotary sleeve about the axis of rotation of said sleeve.

19. In a talking machine, the combination with a support having a tubular socket, of a sleeve supported within said socket, a rotary sleeve supported within said first mentioned sleeve and having one end projecting outside of said first mentioned sleeve, a ring piece adjustably connected to said projecting end, a tubular sound box arm pivotally connected to said ring piece, and a tubular piece between said rotary sleeve and said sound box arm.

20. In a talking machine, the combination with a support having a tubular socket, of a sleeve supported within said socket, a rotary sleeve supported within said first mentioned sleeve and having one end projecting outside of said first mentioned sleeve, a ring piece adjustably connected to said projecting end, a tubular sound box arm pivotally connected to said ring piece, a tubular piece between said rotary sleeve and said sound box arm, and a yielding gasket between said ring piece and said tubular piece.

21. In a talking machine, the combination with a rotary sleeve, of a ring piece surrounding said sleeve and secured thereto, a tubular sound box arm pivotally connected to said ring piece, and a tubular piece between the said rotary sleeve and said sound box arm.

22. In a talking machine, the combination with a rotary sleeve, of a ring piece surrounding said sleeve and adjustably secured thereto, a tubular sound box arm pivotally connected to said ring piece, a tubular piece between the said rotary sleeve and said sound box arm, and a yielding gasket between said ring piece and said tubular piece.

In witness whereof, I have hereunto set my hand this twenty eighth day of November, 1905.

ROBERT L. GIBSON.

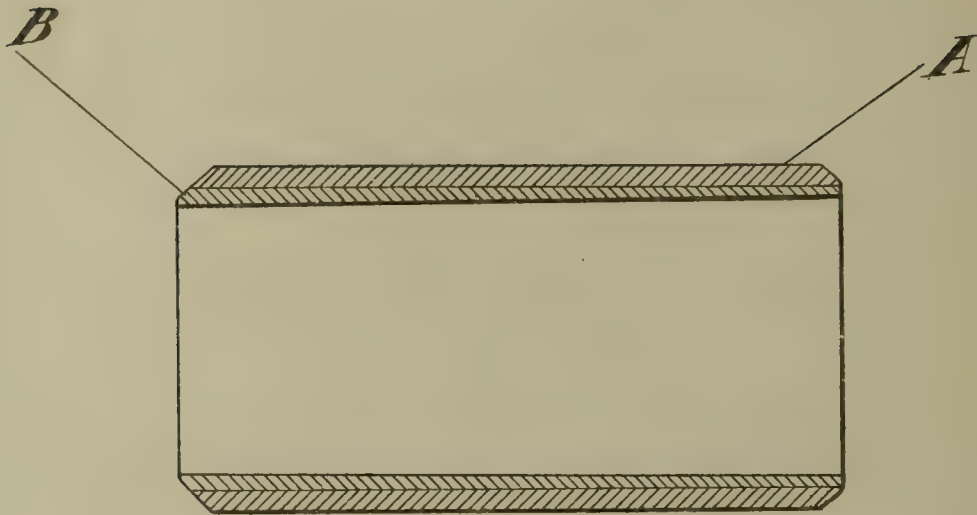
Witnesses:

ERNEST HOWARD HUNTER,
R. M. KELLY.

J. W. AYLSWORTH.
DUPLICATE SOUND RECORD.
APPLICATION FILED NOV. 7, 1906.

958,210.

Patented May 17, 1910.



Witnesses:

Frank D. Rogers

Berna P. Kuhn

Inventor:

James W. Aylsworth

by Frank L. Dyer

Atty.

UNITED STATES PATENT OFFICE.

JONAS W. AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

DUPLICATE SOUND-RECORD.

958,210.

Specification of Letters Patent.

Patented May 17, 1910.

Application filed November 7, 1906. Serial No. 342,318.

To all whom it may concern:

Be it known that I, JONAS W. AYLSWORTH, a citizen of the United States, residing at 223 Midland avenue, East Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Duplicate Sound-Records, of which the following is a description.

My invention relates to an improved duplicate sound record, preferably cylindrical in form, and my object is to provide a record, whose major portion shall be composed of a hard composition incapable of being accurately reamed, such as a composition employing asphalt, but which shall have a perfectly true bore for its reception on the mandrel of a talking machine.

In experimenting with compositions employing asphalt, I have found that although they are very desirable on account of their qualities of cheapness, hardness and great durability, yet, it is very difficult to properly ream out the records formed of such compositions to make them accurately fit the mandrel, since the material is too viscid to be smoothly cut while hot; and, when cold, it is so brittle that if it were attempted to ream it there would be great danger of breaking the record; besides which, the reaming of the record when cold, and hence when removed from the mold, is objectionable, as the record surface is likely to become injured. I find that a composite record can be made by a process consisting in rotating a mold at a high speed and introducing suitable compositions therein which will be distributed over the bore of the mold by the centrifugal force developed, as I disclose in Letters Patent, No. 855,605, dated June 4, 1907, and that if the compositions thus introduced within the mold are of different specific gravities, and are of such a character that they do not mix together, it is possible to distribute them in clearly defined layers, which become intimately welded together. Taking advantage of this fact, I have produced a composite record in which the outer portion thereof, preferably considerably more than half, and which portion carries the record surface, is formed of a very hard tough composition, such as a composition employing asphalt or an equivalent ingredient, while the inner portion of the record is formed of a material which can be readily removed or

turned to shape, such for example, as the ordinary record compositions now used, consisting of stearate of soda, free stearic acid, stearate of alumina, and ceresin, with or without carnauba or equivalent wax. If desired this latter material may contain relatively large proportions of the hydrocarbon ingredient, such as ceresin or paraffin, the only effect of which would be to soften the composition without affecting its reaming qualities. Likewise, it may be mixed with inert substances like clay or finely ground wood fiber, without seriously interfering with its reamability. The asphalt composition which I prefer to employ is made the subject of Letters Patent No. 920,245, granted May 4, 1909, and consists of a mixture of a hard asphalt (such as gilsonite) stearate of lead, and a resin gum (such as copal, kauri, or colophony). This composition can be very perfectly molded by the process indicated in my application for Letters Patent above referred to. After the introduction of the asphalt composition in the mold, the reamable composition is introduced in smaller proportion, and the two compositions will be distributed, the heavier asphalt composition being forced outward so as to take an impression from the mold, and the lighter reamable composition distributing itself over the interior of the asphalt composition. The two layers are very clearly defined, although they are intimately welded together. After the record has been formed, and while hot and still within the mold, it is reamed out in the usual way, this being possible since compositions containing stearate of soda cut very smoothly while hot.

In order that the invention may be better understood, attention is directed to the accompanying drawing, forming part of this specification, and in which I illustrate a sectional view of my improved record.

A represents the outer layer carrying the record surface and formed of a hard, tough composition such as one employing asphalt or similar ingredient, and B the layer of reamable material such as a composition employing stearate of soda.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. A composite record, comprising an outer layer of a hard, tough, but plastic ma-

terial when hot, and an interior layer of a composition reamable when hot, substantially as and for the purposes set forth.

2. A composite record, comprising an
5 outer layer of a hard, tough, but plastic material when hot, and an interior layer of a composition reamable when hot, the two layers being intimately welded together, substantially as and for the purposes set forth.

10 3. A composite record, comprising an outer layer formed of an asphalt composition, and an inner layer formed of a composition reamable when hot, substantially as and for the purposes set forth.

15 4. A composite record, comprising an outer layer formed of an asphalt composition, and an inner layer formed of a composition reamable when hot, the two layers being intimately welded together, substantially
20 tially as and for the purposes set forth.

5. A composite record, comprising an outer layer of an asphalt composition, and an inner layer employing stearate of soda, substantially as set forth.

25 6. A composite record, comprising an outer layer of an asphalt composition and an inner layer employing stearate of soda, the two layers being intimately welded together, substantially as set forth.

30 7. A composite record, comprising an

outer layer formed of a composition employing asphalt and stearate of lead, and an inner layer of a non-viscid material when hot, substantially as and for the purposes set forth.

35

8. A composite record, comprising an outer layer formed of a composition employing asphalt and stearate of lead, and an inner layer employing stearate of soda, substantially as and for the purposes set
40 forth.

9. A composite record, comprising an outer layer formed of an asphalt, stearate of lead, and a resin gum, and an inner layer composed of a non-viscid material when hot, 45 substantially as and for the purposes set forth.

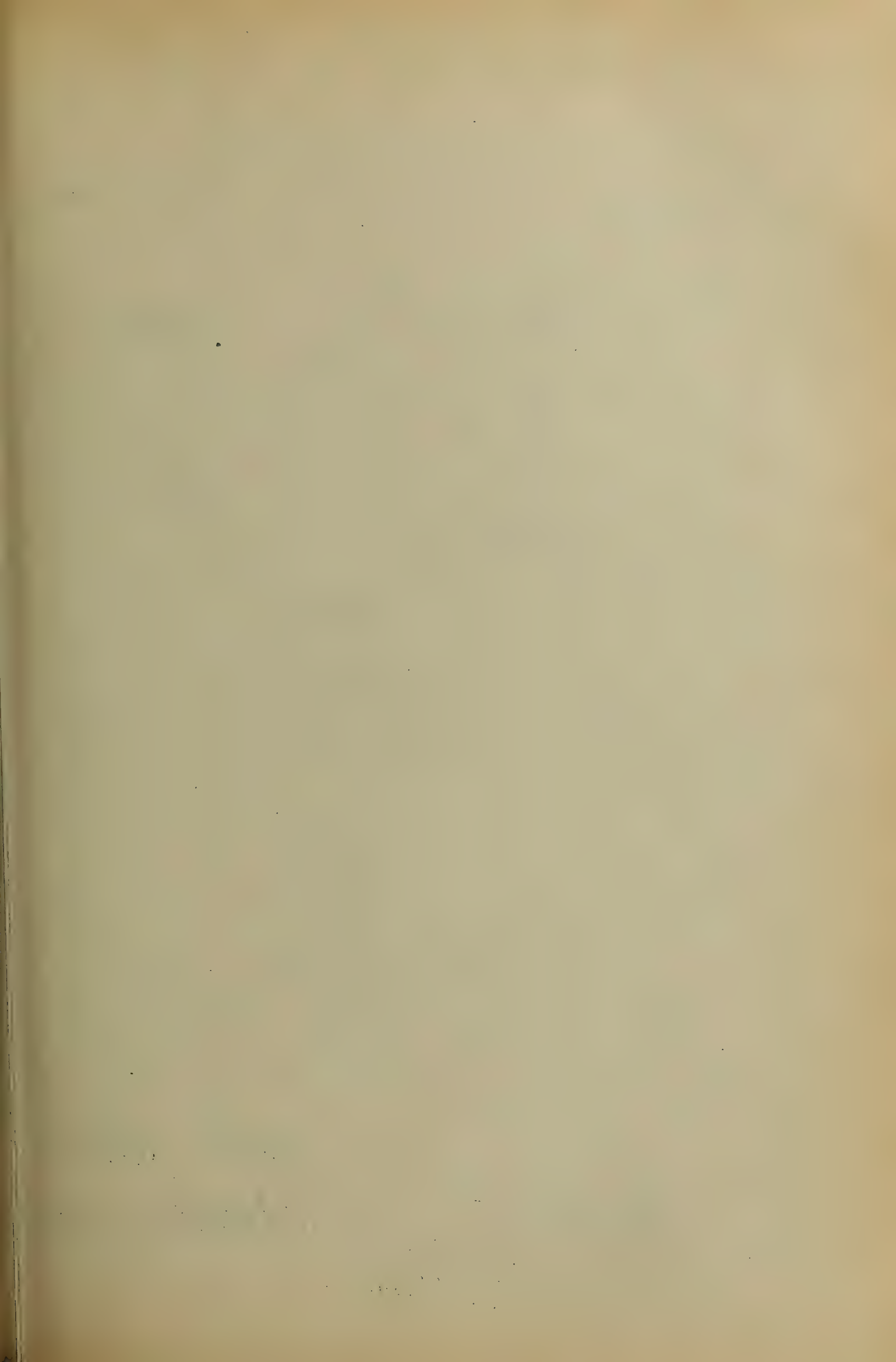
10. A composite record, comprising an outer layer formed of a composition employing asphalt, stearate of lead and a resin 50 gum, and an inner layer employing stearate of soda, substantially as and for the purposes set forth.

This specification signed and witnessed this 3rd day of November 1906.

JONAS W. AYLSWORTH.

Witnesses:

FRANK L. DYER,
ANNA R. KLEHM.



S. LEVIN.
STYLUS FOR SOUND REPRODUCING MACHINES.
APPLICATION FILED JUNE 16, 1909.

Patented May 17, 1910

958,412.

Fig. 1.

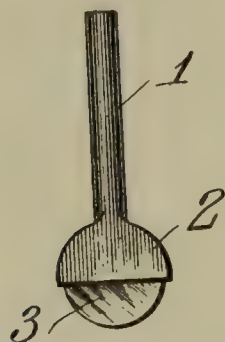


Fig. 2.

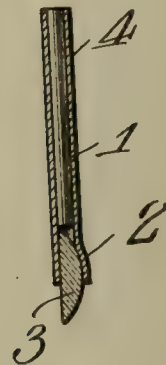


Fig. 3.

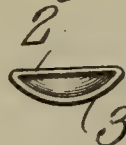


Fig. 4.



Witnesses

E. J. Stewart
F. J. Chapman.

Inventor

Samuel Levin

By *C. A. Snow & Co.*
Attorneys

UNITED STATES PATENT OFFICE.

SAMUEL LEVIN, OF HIGHLAND PARK, ILLINOIS.

STYLUS FOR SOUND-REPRODUCING MACHINES.

958,412.

Specification of Letters Patent.

Patented May 17, 1910.

Application filed June 15, 1909. Serial No. 502,297.

To all whom it may concern:

Be it known that I, SAMUEL LEVIN, a citizen of the United States, residing at Highland Park, in the county of Lake and State of Illinois, have invented a new and useful Stylus for Sound-Reproducing Machines, of which the following is a specification.

This invention has reference to improvements in styli for sound reproducing machines and is designed more especially for use in connection with the disk or gramophone type of sound reproducing machine.

In the gramophone type of sound reproducing machine the sound record is in the form of a sinuous groove of even depth and the diaphragm of the reproducing sound box is vibrated by the engagement of the side walls of the groove with the stylus, the action of the groove on the stylus being usually from both walls of the record groove, but one wall receives more of the wear from the stylus than the other because in this type of machine the sound record groove itself is utilized for feeding the sound box across the record tablet. The stylus most generally employed in connection with sound reproducing machines of the gramophone type is in the form of a steel needle point which enters and substantially fills the groove from wall to wall, or if not, quickly becomes worn to the proper shape, but the continual wear of the record groove against the steel needle, though most pronounced on the needle, is still noticeable after a number of reproductions upon the record tablet itself. This is particularly true should the operator omit to change the stylus for each new tablet reproduced or after one or two reproductions of the same tablet. The necessity of changing the stylus for each reproduction becomes onerous or the changing of the stylus is neglected through carelessness.

It is the object of the present invention to avoid these troubles and at the same time provide a stylus which after being once adjusted to the sound box may be used again and again indefinitely without the necessity of change and without material wear upon the sound record tablet.

It has long been recognized that a jewel point because of its hardness and wear resisting qualities as well as its rigidity would make an ideal reproducing stylus for the gramophone type of sound tablet. However such jewel points have been patterned after the usual steel needle point used in connec-

tion with sound reproducing machines of the gramophone type, but because of the brittleness of the material used, such styli have not proved successful since the points become quickly broken and the sharp edges thus produced are very destructive to the record tablet.

By the present invention the styli are made with jewels for the active end and these jewels are so constructed as to no longer be fragile while practical tests have shown that the life of these styli is almost unlimited.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawings forming a part of this specification, in which drawings,

Figure 1 is an elevation of a stylus constructed in accordance with the present invention. Fig. 2 is a longitudinal section thereof. Fig. 3 is a bottom plan view, and Fig. 4 is a view of a somewhat modified form.

In accordance with the present invention the stylus is made of a body portion in the shape of a tube 1 expanded at one end into a holder 2 of suitable shape to receive and retain a substantially plano-convex jewel 3. This jewel may be of any suitable material, but it is preferably made of garnet, though sapphire or any of the other jewels used in connection with sound reproducing machines may be utilized if so desired. The material employed forms no necessary part of the present invention. The head 2 may be so shaped as to grasp the jewel 3 so firmly that the latter is incapable of independent movement with relation to the head or the stem 1.

Of course it will be understood that the periphery of the jewel need not include a complete circle but the active portion, that is the portion projecting beyond the head or holder should in the structure shown in Fig. 1 include at least a segment of a circle. The active portion of the jewel has the periphery rounded in similitude to the point of the usual needle stylus used in connection with the gramophone type of sound reproducing machine, so that this portion of the jewel may enter the groove and rest on the bottom thereof.

The stem 1 being tubular may be reinforced by a central core 4 of steel or other hard resisting material, or the stem 1 and

head 2 may be made of a solid piece of metal, such as steel and the jewel 3 may be set therein in firm engagement with the head 2. The core 4 may be omitted from the tubular stem for soft effects, while for loud effects the core may be used or the stem may be solid.

In Fig. 4 a slight modification of the form of the jewel 3 is indicated, the active end of the jewel being shown as parabolic in shape but still retains the characteristic of having one face substantially flat and the other face convex.

The stylus as a whole is made of about the size of the ordinary steel styli used in the gramophone type of sound reproducing machines, the showing of the drawings being enlarged.

When the stylus is in place in the sound box the convex side of the stylus is against the feeding wall of the sound groove while the flat side of the stylus is toward the non-feeding wall of the groove.

The walls of the record groove are either curved on arcs described about the center of the tablet as an axis or these walls are in the form of sharper curves due to the sinuities of the groove corresponding to sound waves.

The convex side of the jewel point 3 engages against the active wall of the groove, and being rounded has no wearing effect upon the wall of the groove such as occurs from the tongue at the end of the steel needle which is formed on the needle stylus as soon as the tablet has made a few turns.

Because of the plane surface of the stylus presented to the inactive wall of the groove there is no material wearing of this wall.

By making the jewel nearly or quite circular so far as the projecting portion of the jewel is concerned it may be made quite bulky and correspondingly strong and in this manner the fragility of jewel styli as heretofore provided for the gramophone type of reproducing machines is avoided and the stylus becomes a practical device.

What is claimed is:—

1. A reproducing stylus for sound reproducing machines of the gramophone or disk type, having its active end formed of a plano-convex jewel with the plane and convex surfaces joined by a rounded edge.

2. A stylus for sound reproducing machines of the gramophone or disk type elongated in the direction of travel of the sound record groove and having the face against which the propelling wall of the sound record groove acts convex.

3. A stylus for sound reproducing machines of the gramophone or disk type elongated in the direction of travel of the sound record groove and having the face against which the propelling wall of the sound record groove acts convex and the opposite face plane.

4. A stylus for sound reproducing machines, comprising a metallic stem terminating in a head, and a plano-convex jewel mounted in said head and constituting the active end of the stylus, the convex side of the jewel being adapted to receive the feeding thrust of the sound record groove.

5. A stylus for sound reproducing machines comprising an active end formed of a jewel, a tubular stem having one end formed to receive and retain the jewel point, and a core within the tubular stem for stiffening the same.

6. A stylus for sound reproducing machines having an active end in the form of a jewel of greater extent in the direction of the length of the sound record groove than in the direction of the width of the groove, and having a rounded edge adapted to be engaged by the propelling wall of the groove.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

SAMUEL LEVIN.

Witnesses:

FRED SCHAEFER,
H. L. BOWEN.

L. B. PURCELL.
MEGAPHONE.
APPLICATION FILED NOV. 16, 1909

Patented May 17, 1910.

958,680.

Fig. 1

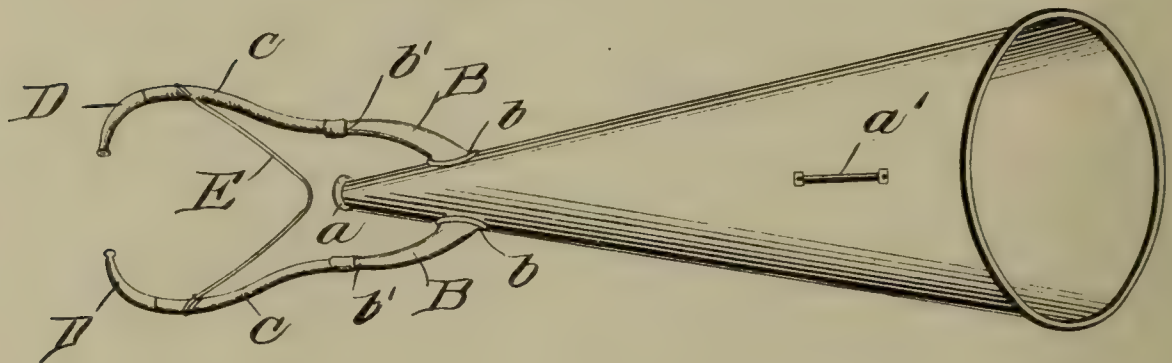


Fig. 2

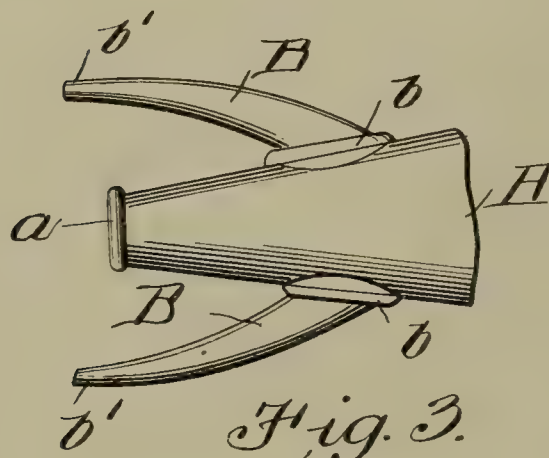
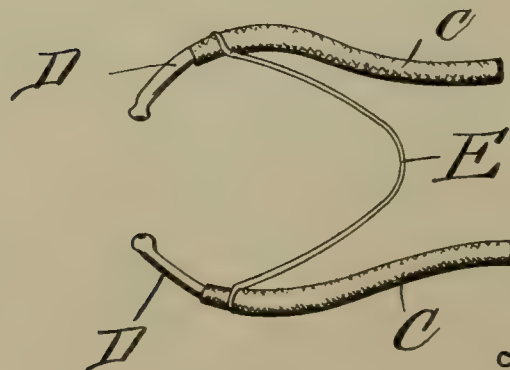


Fig. 3.



Witnesses
Jas. E. Dodge
Byron B. Collings.

Inventor
Lee B. Purcell,
by Millinson, Fisher & Mitherspoon,
Attorneys.

UNITED STATES PATENT OFFICE.

LEE B. PURCELL, OF THE UNITED STATES MARINE CORPS.

MEGAPHONE.

958,680.

Specification of Letters Patent.

Patented May 17, 1910.

Application filed November 16, 1909. Serial No. 528,406.

To all whom it may concern:

Be it known that I, LEE B. PURCELL, captain United States Marine Corps, a citizen of the United States, stationed at Olongapo, in the Philippine Islands, have invented certain new and useful Improvements in Megaphones; and I do hereby declare the following to a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in megaphones and especially in megaphones for use aboard ship, where it is desired to carry on conversation between two vessels or objects at a greater distance apart than sound will carry without the use of such implement. With such implements as are now generally in use, the megaphone is used as a speaking trumpet, and then it is removed from the mouth and carried to the ear, where it is used as a horn to assist the hearing. Words are frequently lost while the implement is being moved from the mouth to the ear, and the purpose of this invention is to provide a combined speaking trumpet and ear horn which may be used as a sender and a receiver for sound. For this purpose, I attach to the ordinary megaphone two ear tubes adapted to be held in the two ears of the user, somewhat in the manner of a binaural stethoscope.

The invention will be understood by reference to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 is a perspective view showing the complete device; Fig. 2, is a detail showing the small end of the megaphone with the flexible ear tubes detached; and, Fig. 3, is a detail showing the flexible ear tubes on a somewhat larger scale than in the other figures.

A represents the body of the megaphone, which is provided with the usual mouth-piece a , and the handles a' may also be pro-

vided. Near the small end of the megaphone oblong or elliptical openings are cut therein, over which are secured the bases b of the metal ear horns B, over the small ends b' of which are secured the flexible ear tubes C, terminating in ear pieces D, adapted to project into the ears of the wearer. These ear pieces are held together by a suitable spring E, or an elastic band may be substituted for the spring, if desired. This spring, or elastic band, E may be slipped either under the chin, or back of the head of the wearer, as may be most convenient.

It will be evident, that the sound waves entering the megaphone will be concentrated in the ear attachments, and that the operator may alternately speak and listen without removing the implement from his mouth.

Having thus described my invention, what I claim and desire to obtain by Letters-Patent from the United States is:

1. A megaphone provided with two ear horns opening into the body of the megaphone in front of the mouthpiece, said ear horns and mouth piece being permanently open to the megaphone with flexible ear tubes connected to said ear horns and ear pieces connected to said ear tubes, substantially as described.

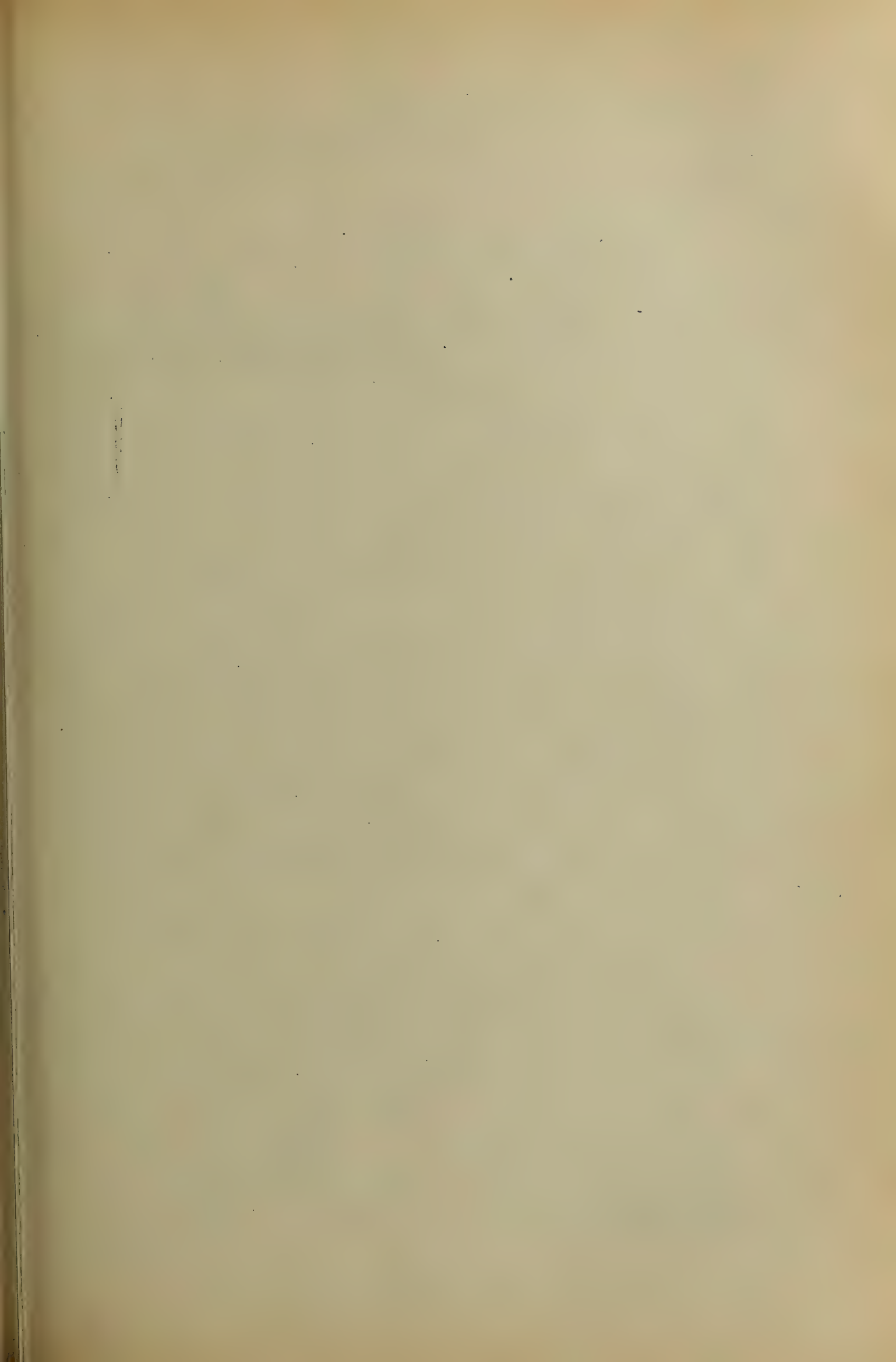
2. A megaphone provided with two ear horns opening into the body of the megaphone in front of the mouthpiece, said ear horns and mouth piece being permanently open to the megaphone with flexible ear tubes connected to said ear horns and ear pieces connected to said ear tubes, with means for holding the ear pieces in engagement with the ears of the wearer, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

LEE B. PURCELL.

Witnesses:

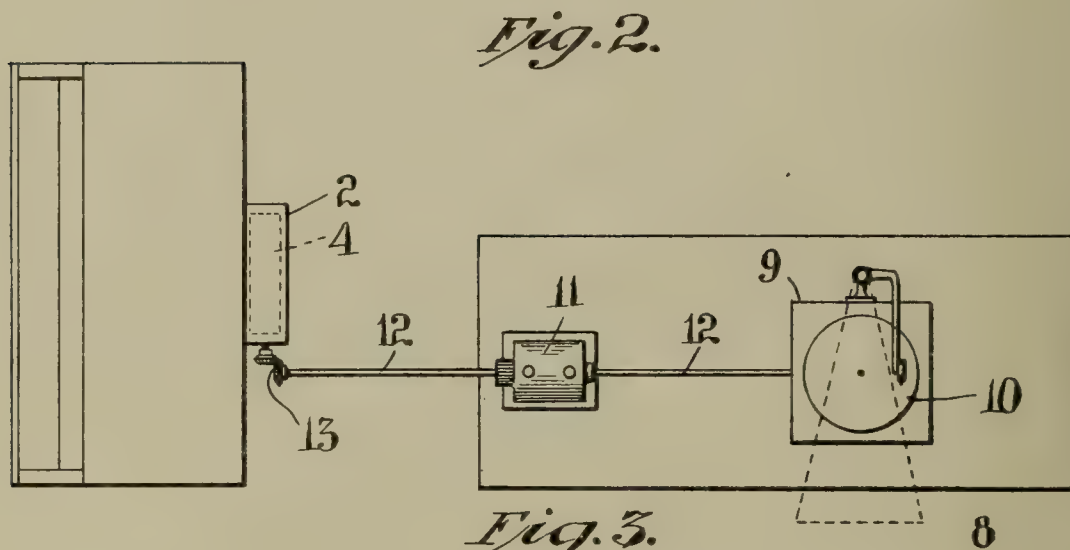
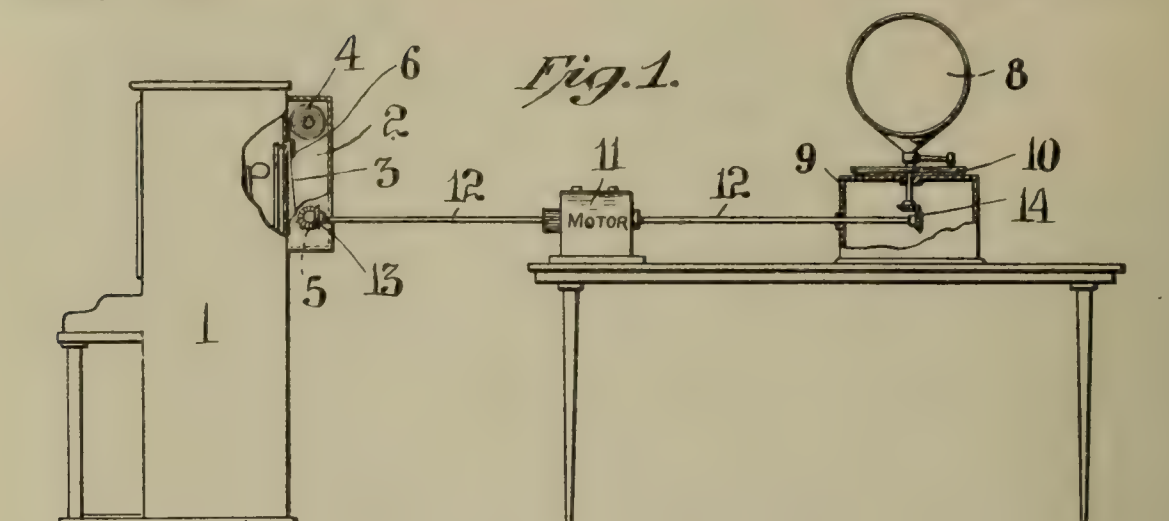
E. H. ELLIS,
JOHN H. OHNET.



W. M. DAVIS.
TALKING MACHINE AND PIANO RECORDING DEVICE.
APPLICATION FILED APR. 17, 1909.

958,730.

Patented May 24, 1910.



Attest:
B. S. Daniels

Inventor:
W. M. Davis
by *Oscar F. Turner* Atty.

UNITED STATES PATENT OFFICE.

WALTER M. DAVIS, OF NEW YORK, N. Y.

TALKING-MACHINE AND PIANO RECORDING DEVICE.

958,730.

Specification of Letters Patent.

Patented May 24, 1910.

Application filed April 17, 1909. Serial No. 490,597.

To all whom it may concern:

Be it known that I, WALTER M. DAVIS, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county of New York and State of New York, have invented certain new and useful Improvements in Talking-Machine and Piano Recording Devices, of which the following is a specification.

This invention relates to a new and improved recording device for talking machines and pianos.

Singers or solo instruments are accompanied by a piano or an orchestra and it has been found that when a talking machine or phonographic record is made by a singer or solo instrument performer the sounds of the voice or solo instrument are clearly recorded for reproduction but the sounds produced by the accompanying piano are faint, blurred, indistinct and resemble the sounds of a banjo, and hence in the reproduction of the performance, by means of talking machine or like devices, the harmonies produced in the original production by the solo instrument or solo voices or voice and the accompanying piano do not appear and the reproduction therefore never equals the original as it is lacking in the beauty, expression and tonal effect of the original performance.

The object of my invention is to produce two records at the same time, one of the sounds produced by the singer or solo instrument and one for the sounds produced by the accompanying piano, the record of the voice or solo instrument being produced in the well known manner on a disk or cylinder of a talking machine or phonograph, the record of the piano tones being produced on a paper strip directly or indirectly by slots or perforations, so that this piano record can be placed into a piano playing device such as for example the well known "pianola." The disk or phonograph then reproduces the vocal or instrumental solo correctly as originally produced and the piano playing mechanism reproduces the piano accompaniment with the same force and effect as originally produced on the accompanying piano, so that the combined result in every respect is a correct copy of the original production.

For this purpose it is necessary, when these two records are made, that the speeds of both coincide and when one blank is moved

faster the other must be moved correspondingly and when one is moved slower the other must be moved correspondingly, so that, when by means of the piano-playing-record and the talking-machine-record the original production is reproduced, the notes of the accompaniment will accord with the corresponding notes of the solo and will not be sounded too late or too soon.

In the accompanying drawings in which like letters of reference indicate like parts in all the figures: Figure 1 illustrates diagrammatically in elevation one embodiment of my improved talking machine and piano recording device. Fig. 2 is a plan view of the same. Fig. 3 is a view of part of the piano record.

The piano 1 is provided with an automatic recording device 2 of any well known construction which produces a record of the notes played on a sheet of paper 3 unrolled from a roll 4 upon a roll 5 and passing over a tracker 6, whereby slots or perforations 7, Fig. 3, are made that correspond to the pitch and time value of the notes played.

The solo performer, say a singer, sings into the horn or receiver 8 of a talking machine 9 of conventional construction, whereby a record of the sounds produced by the solo performer is traced by the stylus upon a disk 10 or equivalent.

It is essential that the paper strip 3 and the disk 10 should be moved at a practically uniform and predetermined speed so that when the paper strip or sheet 3 and the disk are placed into an automatic piano player and talking machine respectively and moved at the same speed at which they were moved when taking the records, they will reproduce respectively the sounds produced by the piano and the soloist in perfect harmony. To this end the roll 5 of the piano recording device and the disk 10 of the talking machine recording device are driven from a common motor 11, which in the embodiment shown, for example, drives the roll 5 and the disk 10 by means of a shaft 12 and bevel gearing 13 and 14. Neither recording device can move singly and both must move simultaneously and uniformly.

In reproducing sounds on a talking machine or phonograph, the pin or stylus runs on the smooth part of the disk or cylinder, for a greater or less undetermined and variable length of time before it encounters the beginning of the line of undulations

which reproduce the sounds by means of the stylus and diaphragm, and thus it would be very difficult to begin the reproduction of the accompaniment at the proper time.

5 Therefore, directly before the soloist begins, the accompanist produces a signal on the piano, say by striking the middle C three times in succession, as represented by the dotted circles 15 in Fig. 3 and, of
10 course, these sounds would be reproduced faintly by the talking machine or phonograph record. As there is no need of reproducing them on the piano player they are closed or pasted over on the note sheet.

15 The performer on the accompanying piano player mechanism adjusts the note sheet so that the first notes of the accompaniment are just in front of the line of ducts in the tracker board and waits until
20 the talking machine or phonograph disk produces the predetermined signal notes and then instantly releases the sheet or throws the coupling of the music roll into gear with the feed mechanism of the piano player.

25 Of course in the reproducing means the note sheet and talking machine disk must henceforth be moved at the same rate of speed they had while being made, but this forms the subject matter of my application,
30 Serial No. 490,596 filed conjointly with this one.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

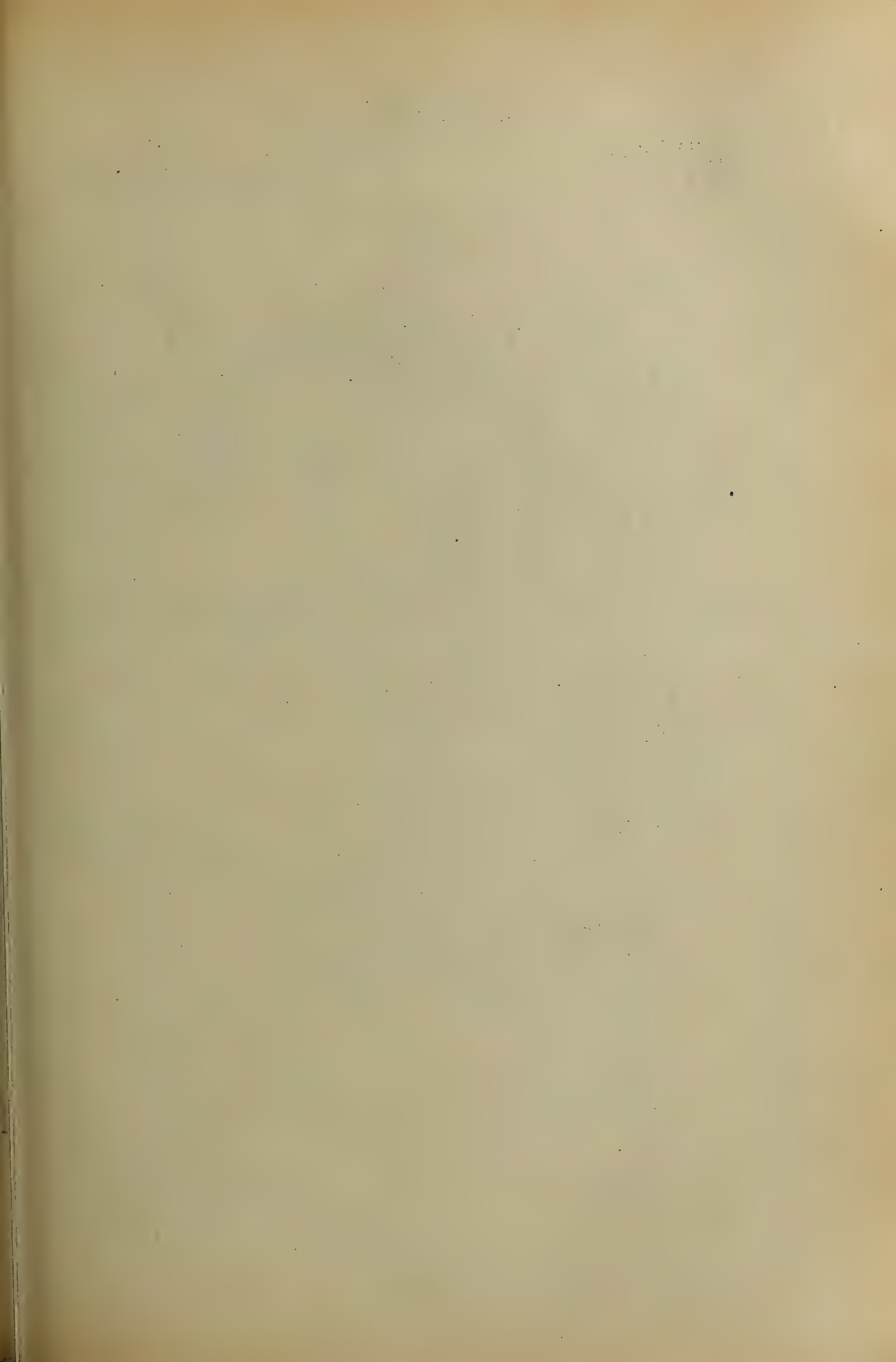
The combination with a piano, of mechanism for moving a sheet of paper and mechanism for making upon this moving paper a record of the notes produced in playing the piano, and means for making a talking machine record of another musical performance produced at the same time and place with the piano performance, of which the record is being produced on the sheet of paper in playing the piano, and motor means for operating the talking machine record, and the above-mentioned paper-sheet-moving mechanism at the same time and at the same relative speeds, whereby the records, made at the same time, of notes produced on the piano and the sounds received by the talking machine, at the same time are recorded in both recording means at the same relative speeds at which they are produced.

Signed at New York city in the county of New York and State of New York this 15th day of April A. D. 1909.

WALTER M. DAVIS.

Witnesses:

FRANK E. RAFFMAN,
OSCAR F. GUNZ.



C. LINDSTRÖM.
TALKING MACHINE MECHANISM.
APPLICATION FILED FEB. 27, 1909.

959,238.

Patented May 24, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

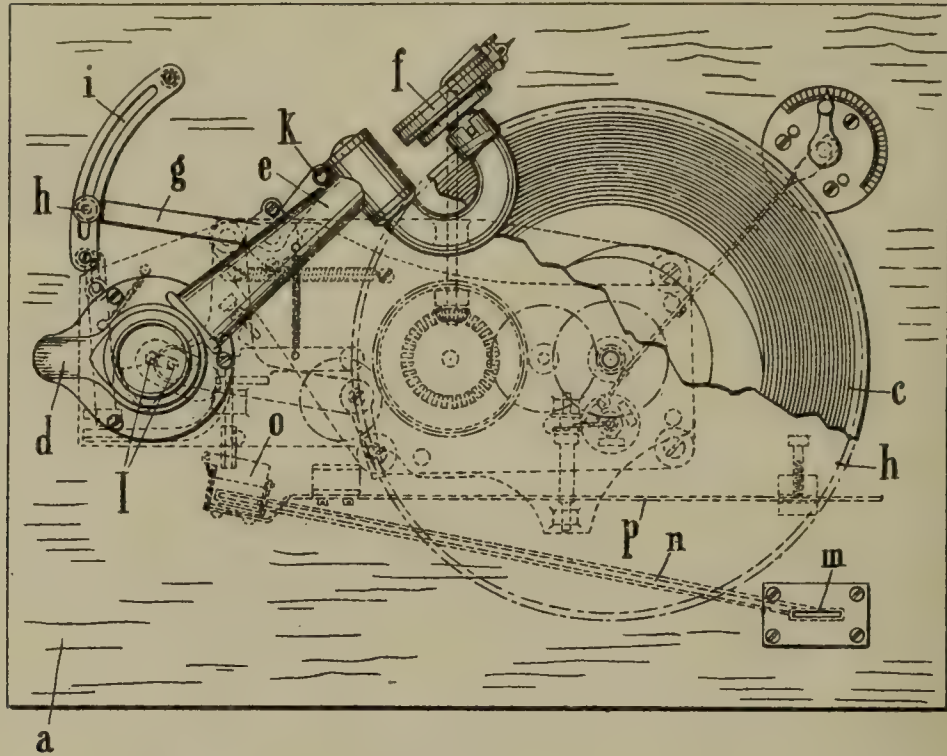
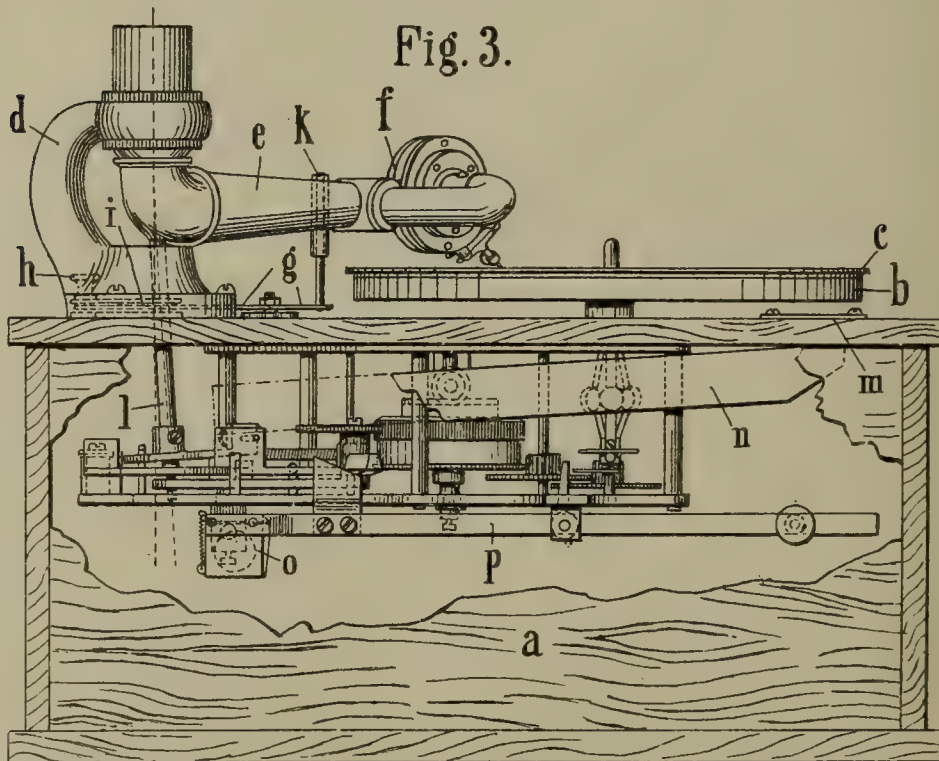


Fig. 3.



WITNESSES:

Fannie Fisk
H. J. Suhrbier

INVENTOR

Carl Lindström
BY *James Logan*
ATTORNEYS.

C. LINDSTRÖM.
TALKING MACHINE MECHANISM.
APPLICATION FILED FEB. 27, 1909.

959,238.

Patented May 24, 1910.
2 SHEETS—SHEET 2.

Fig. 2.

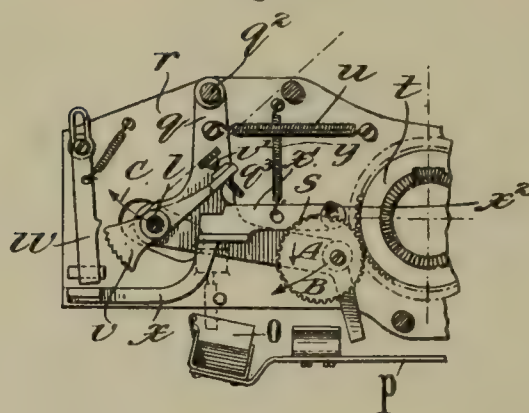
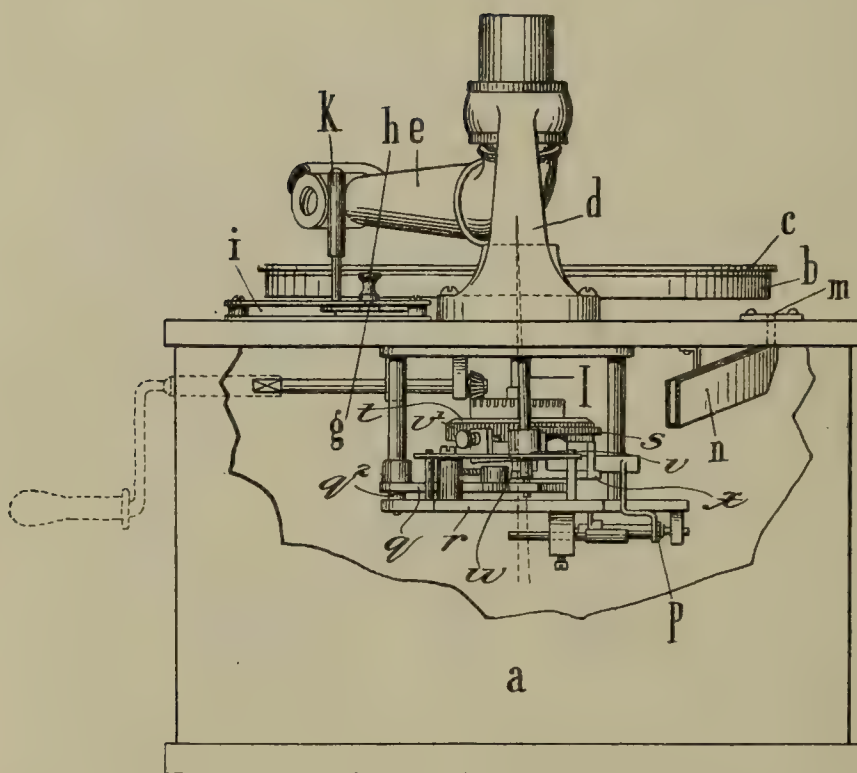


Fig. 4.



WITNESSES:

Fannie Fisk
A. J. Suhrbier

INVENTOR
Carl Lindström
BY *James S. [unclear]*
ATTORNEYS.

UNITED STATES PATENT OFFICE.

CARL LINDSTRÖM, OF BERLIN, GERMANY.

TALKING-MACHINE MECHANISM.

959,238.

Specification of Letters Patent.

Patented May 24, 1910.

Application filed February 27, 1909. Serial No. 480,447.

To all whom it may concern:

Be it known that I, CARL LINDSTRÖM, a citizen of the Kingdom of Sweden, residing in the city of Berlin, in the Empire of Germany, have invented certain new and useful Improvements in Talking-Machine Mechanism, of which the following is a specification.

My present invention relates to mechanisms for talking machines and a primary object is to provide an improved device for starting and stopping the sound-box containing the diaphragm. The arrangement of the driving mechanism and the means for starting of the record-plate do not form part of the subject-matter of the invention.

In order that the invention may be clearly understood reference will be made to the accompanying drawings in which one constructional form is represented by way of example, and in which:

Figure 1 is a top plan view of the mechanism and talking machine, part of the record being shown broken away and the mechanism in the box being shown in dotted lines, whereas Fig. 2 is a like view in full lines of the releasing mechanism, and Fig. 3 is a side elevation of the machine, part of the side of the case being broken away, and Fig. 4 is a rear end elevation, part of the case being shown broken away.

Similar reference letters denominate like parts in all views.

Referring to the drawings, in the case *a* is arranged in the usual manner the clockwork for driving in well-known manner, the plate *b* which holds the record or disks *c*. The bracket *d* carries the usual horn, which is not represented in the drawing, and one end of the sound-arm *e*, at the other end of which the sound-box *f* is attached. The arm *e* is adjusted, according to the diameter of the record in each instance, by a bent lever *g* which likewise forms no part of the subject-matter of the invention and which is firmly held by means of the set-screw *h* in a link *i*, so that when the sound-arm swings outward its movement is limited by a buffer or stop *k*. The arm *e* swings around an axle *l*, the position of which is of decisive importance for the present invention. In the non-working position this axle is located slantwise, as clearly shown in Figs. 3 and 4; consequently the arm *e* carrying the box *f* is held by its own weight in the swung-around position and lying against the stop *k*. Now when a coin is inserted through the slot *m* it runs along

the channel *n* and falls into the box *o* which is brought by the weight of the coin into the position ready for playing and releases the driving mechanism in known manner. The clockwork then moves, and the axle *l* is brought, as hereinafter described, by the releasing device, shown clearly in Fig. 2, into the vertical position and consequently the needle of the sound-box falls into the groove of the record.

Referring now particularly to Fig. 2, the axle *l* rests with its bottom end on a bell-crank lever *q* pivoted at *q*² on the plate *r*. This lever *q* also carries a toothed wheel *s* mounted eccentrically thereon and meshing with teeth on the spring barrel *t* of the driving mechanism. A spring *u* attached to the plate *r* and lever *q* constantly tends to keep the wheel *s* in engagement with the spring barrel. On the axle *l* is fixed a member *v* carrying at one end a set-screw *v*¹ and provided at its other end with teeth, as clearly shown, adapted to be engaged by a spring-pulled pawl *w* when the axle *l* is rotated outward. The pawl *w* is kept in engagement with the member *v* owing to its end being held, as explained hereafter, by the bent arm *x* provided with a shoulder *x*¹ and movable around the pivot *x*² on the plate *r*. This arm *x* is kept in its normal position resting against a stop *q*³ on the lever *q* by the spring *y* attached to the plate *r*. Now when the arm *e* is in the outside position shown in Fig. 1 and the axle *l* is in a slanting position, the lever *q* is in the position shown in Fig. 2. When the driving mechanism is released, as above described, the barrel *t* is rotated, say clockwise, and drives the eccentric wheel *s* in the direction indicated by its arrow *A*, whereby its pivot is driven in the direction of the arrow *B* so that the axle *l* moves in the direction of the arrow *C* until it arrives into a vertical position, the member *v* simultaneously being engaged by the pawl *w*. The stop *q*³ slides along the member *x* into an incision in the same so that the pawl *w* is held by the end of the arm *x*, and the lever *q* is prevented from being returned by the spring *u* into its normal position. Now when the arm *e* is brought inward, owing to the needle moving in the spiral groove of the record, the axle *l* and with it the member *v* is rotated, and the set-screw *v*¹ finally strikes against the shoulder *x*¹ and the arm *x* is released from the end of the pawl *w* and from

the stop q^s . When the lever q is moved into the position in which the axle l is vertical, the toothed wheel s is brought out of engagement with the barrel t in known manner, so that the wheel s is no longer rotated while the talking machine is playing. When the piece is finished the needle is guided by the groove of the record to the center of the disk. It is here released in well-known manner and the axle is returned into its slanting position as above described; the lever p returns into its normal position, the box o is lifted and brought into its normal position, and the mechanism is ready for receiving another coin. Owing to the slanting position of the axle l the arm e has been swung out and raised and is out of action.

It is to be understood that the releasing means shown in and described with reference to Fig. 2 for moving the axle l into the vertical position and allowing the same to return into a slanting position are shown merely by way of example and that various modifications can be made without departing from the spirit and scope of the invention. But an essential feature of the construction according to the invention is that the slanting position of the axle carrying the sound-arm is operative in starting and stopping the talking machine.

I claim:

1. In a mechanism for talking machines, the combination of a sound-arm an axle carrying the sound-arm, said axle being adapted to stand in a slanting position when said arm is in its extreme positions, and means for placing said axle into vertical position, for the purpose specified.

2. In a mechanism for talking machines,

the combination of a sound-arm an axle carrying the sound-arm, said axle being adapted to stand in a slanting position when said arm is in its extreme positions, driving mechanism, and releasing mechanism comprising a spring-pulled lever carrying said axle, and a wheel on the lever adapted to be driven by the driving mechanism, and to place said axle into vertical position, for the purpose specified.

3. In a mechanism for talking machines, the combination of a sound-arm an axle carrying the sound-arm, said axle being adapted to stand in a slanting position when said arm is in its extreme positions; releasing mechanism comprising a spring-pulled lever carrying said axle, and a wheel eccentrically mounted on the lever and adapted to be driven by the driving mechanism of the talking machine, and to place said axle into vertical position; detent means for holding said axle in its vertical position; and means for releasing said detent means and returning the axle into its slanting position.

4. In an automatic talking machine, the combination, with the sound-arm, of a normally slanting axle carrying the same, and motor-actuated releasing mechanism carrying the axle for automatically placing the same into vertical position and returning it into a slanting position, for the purpose specified.

The foregoing specification signed at Berlin, this 11th day of February, 1909.

CARL LINDSTRÖM.

In presence of—

WOLDEMAR HAUPT,
HENRY HASPER.

W. H. DESSUREAU.
MUSICAL INSTRUMENT.
APPLICATION FILED SEPT. 22, 1909.

959,318.

Patented May 24, 1910.

Fig. 1.

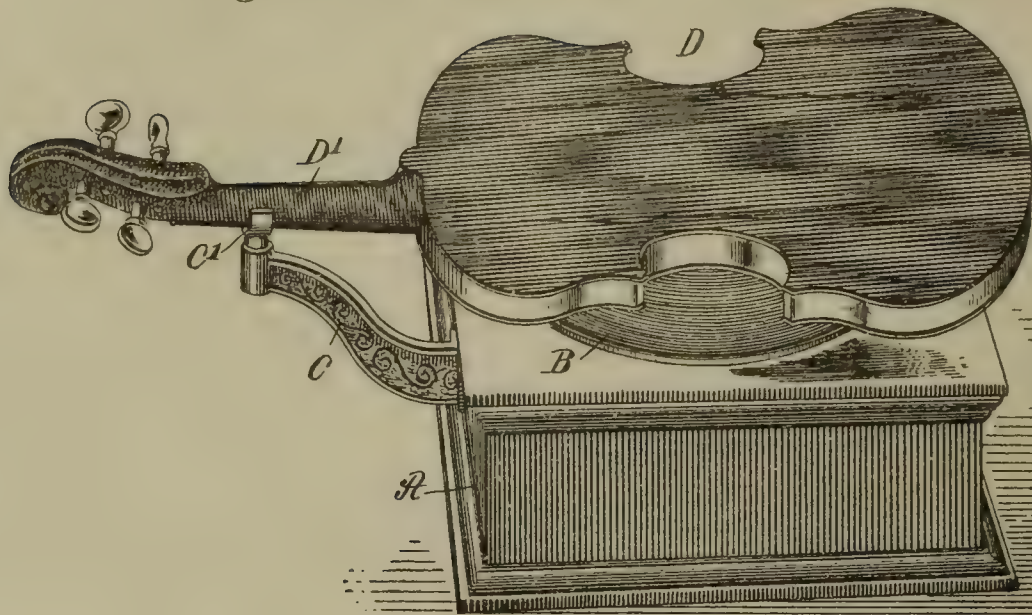


Fig. 2.

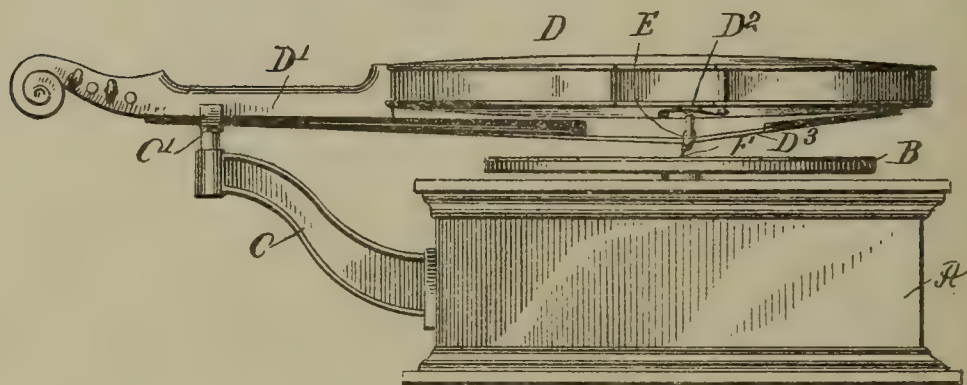
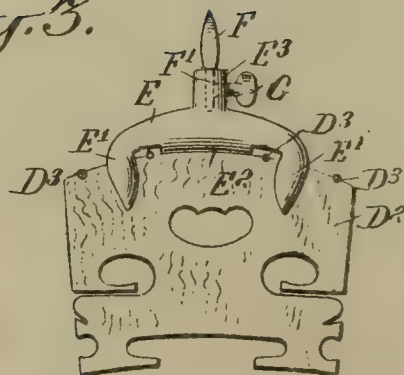


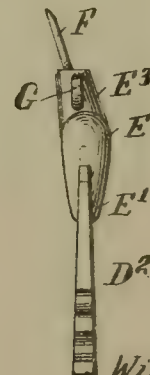
Fig. 3.



WITNESSES

Geo. W. Taylor
Rev. H. H. Hester

Fig. 4.



INVENTOR

William H Dessureau

BY

Mum Co
ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM H. DESSUREAU, OF HAZELHURST, WISCONSIN.

MUSICAL INSTRUMENT.

959,318.

Specification of Letters Patent. Patented May 24, 1910.

Application filed September 22, 1909. Serial No. 518,988.

To all whom it may concern:

Be it known that I, WILLIAM H. DESSUREAU, a citizen of the United States, and a resident of Hazelhurst, in the county of Oneida and State of Wisconsin, have invented a new and Improved Musical Instrument, of which the following is a full, clear and exact description.

The invention relates to gramophones, and its object is to provide an improved means for connecting the stylus with the bridge of a violin, and for supporting a violin on the casing of the gramophone.

For the purpose mentioned a stylus or needle is attached to a violin or a like instrument, and the latter is held suspended, with the stylus or needle in contact with a revolving record, so that the violin forms the sound reproducer and amplifier.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a perspective view of the improved musical instrument; Fig. 2 is a side elevation of the same; Fig. 3 is an enlarged face view of the bridge of the violin and the stylus or pin in position thereon; and Fig. 4 is an edge view of the same.

The casing A contains a motor (not shown) for driving the record B, and on one side of the casing A is secured an arm C, carrying at its free end a rest C' for receiving and supporting the neck D' of a violin D of any approved construction. The violin D is provided at its bridge D² with a carrier E, supporting a stylus or a needle F in contact with the record B, as plainly shown in Fig. 2. The carrier E is preferably provided with clamping forks or arms E', straddling the bridge between the adjacent strings D³ (see Figs. 3 and 4) and the said carrier E is also provided on its under side with a curved contact portion E², seated on the top of the bridge, to make a firm contact between the carrier E and the bridge D². The carrier E is provided on its top with a socket E³ for receiving the shank F' of a stylus or needle F, and a set screw G serves to fasten the stylus in place on the carrier E.

By the arrangement described, the carrier E with the stylus or needle F attached thereto can be readily placed in position on the bridge D² of the violin D, whenever it is de-

sired to use the violin as the sound reproducer and sound amplifier, it being understood that when the violin D is in position on the rest C', and the stylus or needle F is in contact with the record B and the latter is rotated, then the record sounds are reproduced, as the violin D serves as a reproducer and amplifier. By the arrangement described the harshness in reproduction of the sounds is avoided and undesirable metallic sounds are eliminated.

The carrier E with the stylus or needle F can be readily attached to the bridges of various violins, and the violins can be successively tested, so as to enable a customer to make a proper selection when buying a violin in a store, it being understood that the customer is readily enabled to judge for himself which of the violins produces the softest and sweetest tones especially when using the same record B when testing the various violins.

Although I have shown the instrument provided with a disk record, it is evident that a cylinder record medium may be used and the stylus or needle provided with a sapphire or other point.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In combination, a casing provided with a rest, a record mounted to turn on the casing, a violin having its neck resting on the rest, and having its body extending over the record, a stylus, and means for securing the stylus on the bridge, said means comprising a carrier provided at each end with clamping forks for engaging the bridge, said carrier having on its upper side a curved contact portion for engaging the bridge.
2. In a device of the class described, a carrier provided at each end with a clamping fork for engaging a bridge, and with a contact portion intermediate the forks, said forks being spaced apart from the ends of the contact portion to receive a string therebetween.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM H. DESSUREAU.

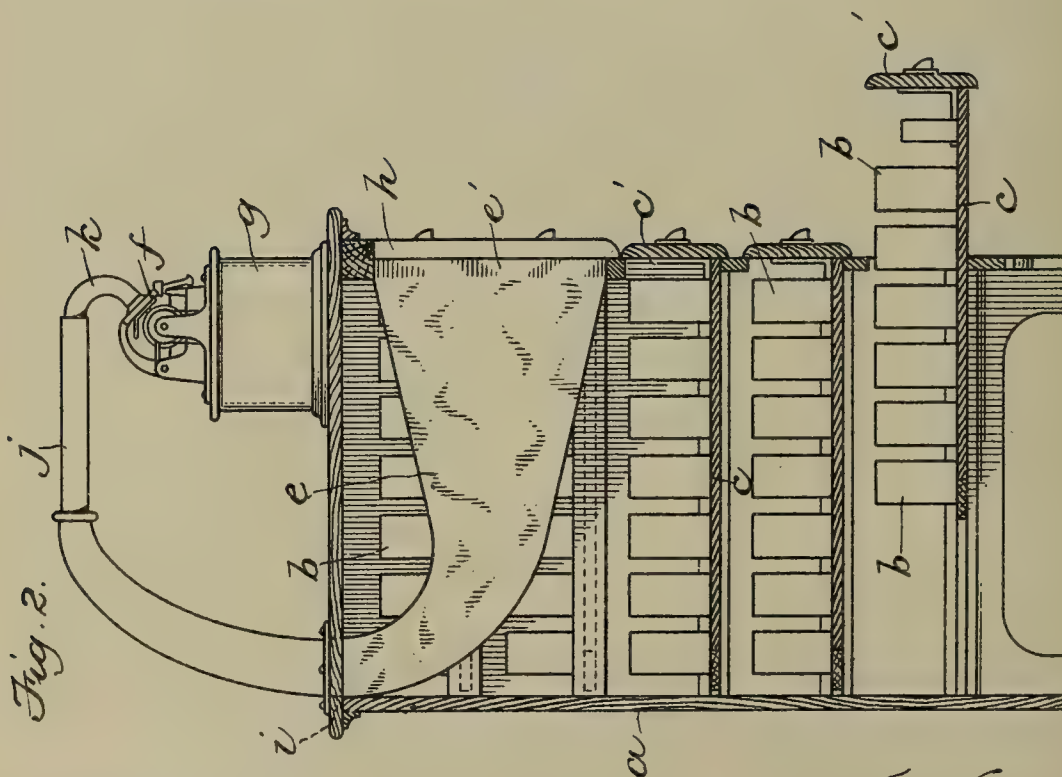
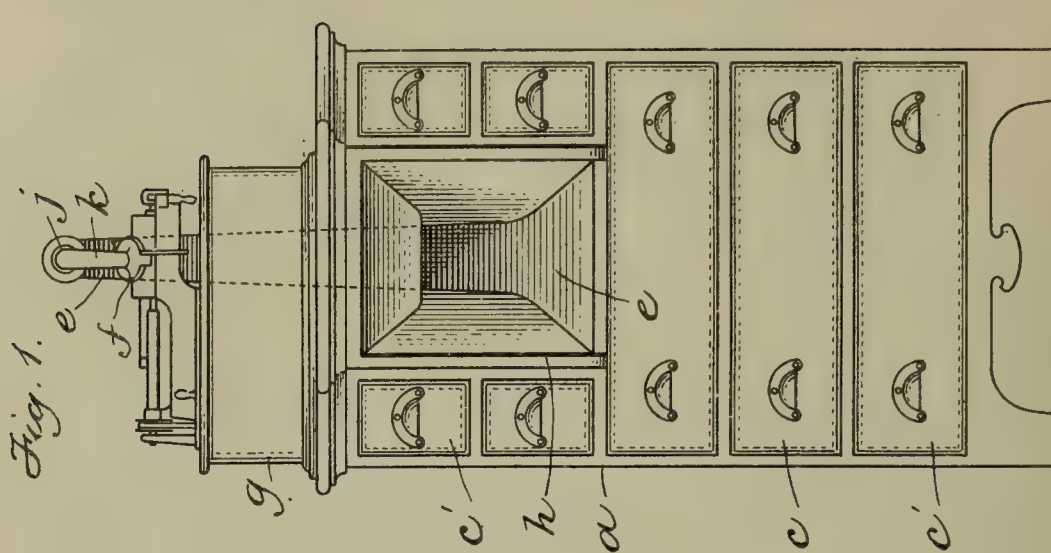
Witnesses:

J. E. WHALEY,
H. W. THOMPSON.

E. A. HALL.
 PHONOGRAPH CABINET.
 APPLICATION FILED MAR. 9, 1908.

959,522.

Patented May 31, 1910.



Witnesses:
 P. W. Pizzuti
 B. Baichelder

Inventor
 Edward A. Hall
 by Knight Brown Lundy & May
 Attorneys.

UNITED STATES PATENT OFFICE.

EDWIN A. HALL, OF HYDE PARK, MASSACHUSETTS.

PHONOGRAPH-CABINET.

959,522.

Specification of Letters Patent.

Patented May 31, 1910.

Application filed March 9, 1908. Serial No. 419,862.

To all whom it may concern:

Be it known that I, EDWIN A. HALL, of Hyde Park, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Phonograph-Cabinets, of which the following is a specification.

This invention relates to a cabinet used for supporting a phonograph, and for containing the record cylinders used in operating the phonograph.

The invention has for its object to enable the sound amplifying horn of a phonograph to be contained mainly within the said cabinet, so that the entire outfit, including the phonograph, the cabinet and the horn, will be reduced to compact form, and the disadvantage and inconvenience of a horn projecting outwardly above the phonograph will be obviated.

The invention consists of an improved construction and arrangement of a phonograph cabinet and a phonograph horn located in said cabinet and its connection with the traveling diaphragm holder, as herein-after set forth and claimed.

Of the accompanying drawings, forming a part of this specification,—Figure 1 represents a front elevation of a phonograph cabinet embodying my invention, and a phonograph supported thereon. Fig. 2 represents an end elevation, the cabinet being shown in section.

The same letters of reference indicate the same parts in all the figures.

In the drawings *a* represents a cabinet which may be of any desired form, and is provided with means for holding a plurality of cylindrical phonograph records *b*. As here shown, the records are supported on slides *c* having front end pieces *c'*, which close openings provided in the front of the cabinet for the insertion and removal of slides and records.

In carrying out my invention I devote a portion of the interior of the cabinet to the storage of the sound amplifying horn *e*, which conducts the sound waves from the traveling diaphragm *f* forming a part of a phonograph which has the usual casing *g* supported on the flat top of the cabinet *a*. The horn *e* formed in one piece as shown may be made of sheet metal or any other suitable material, and has an enlarged end or mouth *e'* which occupies an opening *h* formed for its reception in the front side

of the cabinet *a*. The horn extends from the opening *h* through the upper part of the interior of the casing, and is curved upwardly, and its neck extends through an opening *i* formed in the top of the cabinet. The neck of the horn extends upward for some distance above the top of the cabinet, and curves forward toward the phonograph, its upper end being connected with the diaphragm holder *f* by a section of flexible tubing *j*, and a curved section *k* of rigid tubing attached to the diaphragm holder.

It will be seen that the major portion of the horn is contained in the cabinet, so that it is not only securely supported against accidental displacement, but is comparatively inconspicuous, and removes from the outfit the unwieldly and bulky appearance presented by a phonograph having a horn projecting above it. The outfit as a whole, including the phonograph, the horn and the cabinet, is therefore reduced to a compact form, and presents a much more desirable appearance than an outfit in which the horn projects above the phonograph, as usual.

I have here shown the horn located midway between the ends of the cabinet, the spaces between the sides of the horn and the ends of the cabinet being utilized to hold narrow record carrying slides.

I have found that in practice the horn located in the cabinet as shown, emits a clearer, smoother and more distinct tone than an ordinary horn supported in the usual manner.

I claim:

A phonograph cabinet having horn-receiving openings in its top and one side, a horn with an extended curved neck formed in one piece, the main body of the horn being within the cabinet, with its mouth in the side opening, and the curved neck extending through the opening in the top and extending for some distance above, and arched inwardly over the top, a phonograph and its casing mounted on said top, and having a short tube projecting inwardly in a single curve directly from its diaphragm holder, and a flexible tube connecting the said short curved tube with the extended end of the horn.

In testimony whereof I have affixed my signature, in presence of two witnesses.

E. A. HALL.

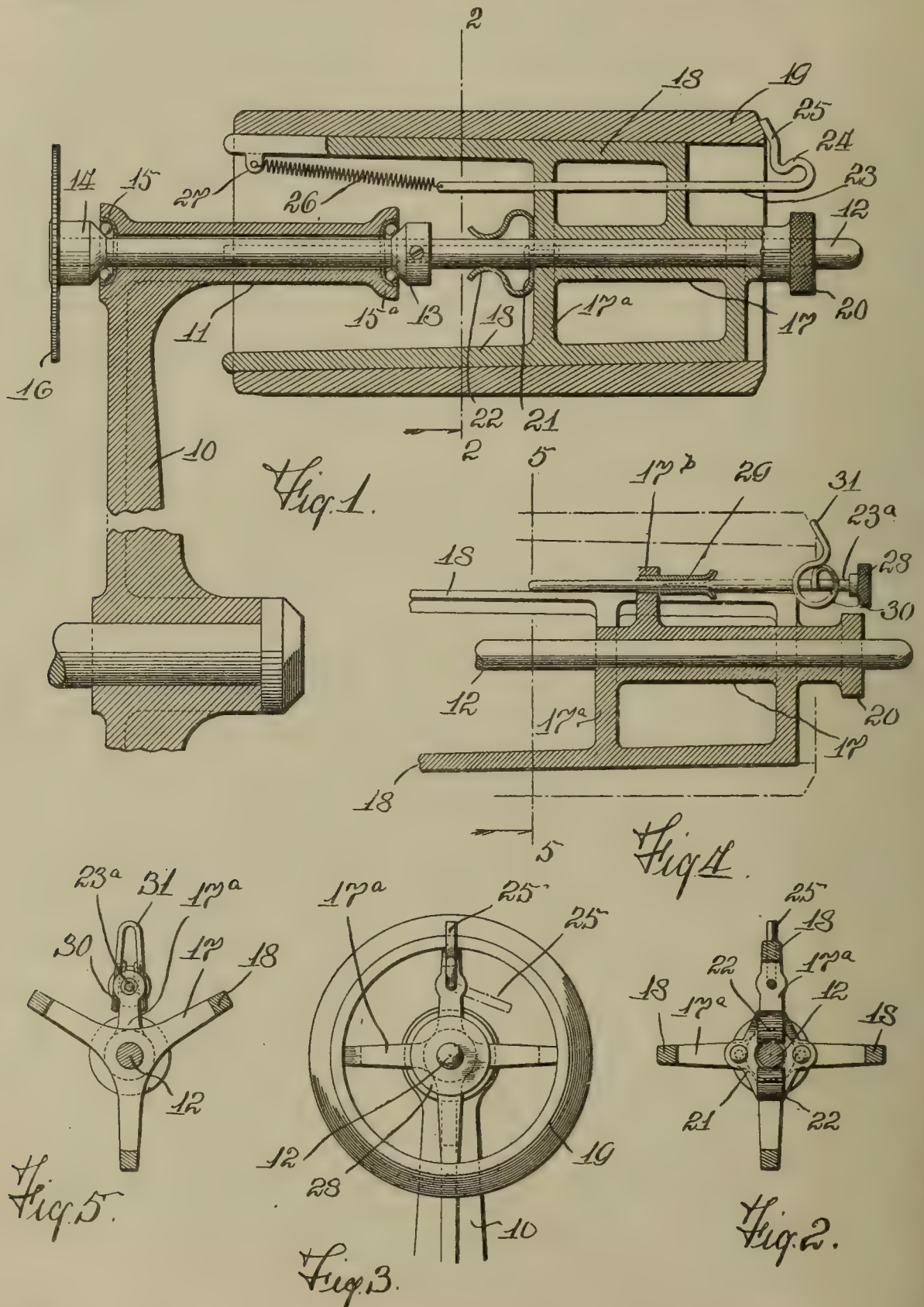
Witnesses:

C. F. BROWN,
ARTHUR H. BROWN.

J. ROEVER.
RECORD HOLDER.
APPLICATION FILED JUNE 8, 1909.

959,610.

Patented May 31, 1910.



Witnesses:
Frank L. Stubbs.
Arthur J. Darnell.

Julius Roever, Inventor.
By his Attorney,
W. B. Hutchinson.

UNITED STATES PATENT OFFICE.

JULIUS ROEVER, OF NEW YORK, N. Y.

RECORD-HOLDER.

959,610.

Specification of Letters Patent.

Patented May 31, 1910.

Application filed June 8, 1909. Serial No. 500,982.

To all whom it may concern:

Be it known that I, JULIUS ROEVER, of the city of New York, county of Kings, and State of New York, have invented a new and useful Improvement in Record-Holders, of which the following is a full, clear, and exact description.

My invention relates to improvement in record holders for phonograph records. These come in cylindrical form, and my invention relates especially to that class of holders which hold a series of records on a wheel or other rotary device so that the records can be brought into successive operation. In record holders of this kind it has been found difficult to get a structure which would permit a record to be easily slipped on or removed, and which would hold the record lightly yet securely and permit it to be easily adjusted so that the needle of the machine will strike exactly the right point. Most record holders have devices which while entering the record, also grip the ends of it, and these are objectionable because they do not allow sufficiently for the contraction and expansion, and they are awkward to handle and manage.

The object of my invention is to produce a simple form of record holder which is cheap, and to which a record can be easily applied, and further to produce a record holder which will hold the record in a manner to permit it to be adjusted with the utmost nicety, which will not interfere with the contraction and expansion of the record, and which will have no parts gripping the ends of the record.

Another object of my invention, and the main object in fact, is to produce a satisfactory record holder which will permit a record to be instantly slipped on endwise over the holder, without the necessity of adjusting or operating any mechanism. In my invention the only part that touches the end of the record is a light finger connected with a tension spring, and this touches merely one point on one end of the record.

Reference is to be had to the accompanying drawings forming a part of this invention, in which similar reference characters indicate corresponding parts in all the views.

Figure 1 is a longitudinal section of a record holder embodying my invention, showing a record thereon, and showing the holder attached to a machine. Fig. 2 is a

cross section on the line 2—2 of Fig. 1 through the record holder, the record being removed. Fig. 3 is an end view of the record holder with the record thereon. Fig. 4 is a broken longitudinal section of a slightly modified form of record holder, and Fig. 5 is a cross section on the line 5—5 of Fig. 4.

The means for carrying the record holder is immaterial and forms no part of the invention. In order that the invention may be understood, however, I have illustrated a wheel having spokes 10, each of which has a bearing sleeve 11 arranged parallel with the axis of the wheel, and in this is held a shaft or spindle 12 having cones 13 and 14 thereon which form parts of the ball bearings 15 and 15^a. At one end the shaft has also a friction wheel 16 to drive it, but any form of rotary support can be substituted for the wheel spokes 10, any desirable bearings can be used for carrying the shaft 12, and any preferred means can be employed for driving the shaft without in the least affecting the principle of my invention.

The record holder proper is carried on the shaft or spindle 12, and it comprises an elongated hub or sleeve 17 having radial spokes 17^a, and longitudinal ribs 18 at the ends of the spokes, these ribs being spaced apart so that they will fit snugly against the inner wall of a record 19, and the parts 17, 17^a and 18 thus form a spider which can be slightly smaller in cross section at one end than at the other, so that the record 19 which has a similar inner conformation, can be readily slipped on the spider and will be frictionally held by the ribs 18. Obviously there can be any desired number of these ribs 18 and corresponding spokes 17^a, and in Fig. 2 I have shown four such parts, and in Fig. 5, three. For convenience the spider of the record holder has at the outer end a handle 20 which can conveniently be in the form of a milled wheel as shown, and by this the spider can be moved longitudinally. The spider is easily adjustable lengthwise on the shaft 12, but it must also stay in the place where it is fixed, and I use a spring drag for this purpose, which is preferably in the form of a plate spring 21 attached to the inner end of the hub 17, and the shaft 12 extends through the spring. The spring has outwardly extending curved arms 22 which have a tendency to come together, and which thus grip fric-

tionally the shaft 12, but the ends of the spring arms 22 are curved outward so that the spider can be readily pushed on the shaft. Obviously the particular construction of the spring drag or friction device can be changed without affecting the principle of the invention, although I claim the structure of it as shown, and prefer this arrangement.

It is sometimes necessary to provide a nicer adjustment of the record 19 on the holder than is afforded by simply pushing it upon the holder as already described, and to this end I use the following device. A light rod 23 extends longitudinally through the spokes 17^a of the spider, and at its outer end the rod is curved to give it a spring action as shown at 24, and it terminates in a light finger 25 which presses against the outer end of the cylinder or record 19. The inner end of the rod 23 connects by a light tension spring 26 with one of the ribs 18 of the record holding spider, and the connection can be conveniently made by having a lug 27 on the rib. It will be seen that after the record is placed on the record holder, it can be nicely adjusted thereon by moving it one way or the other against the tension of the spring 26, and this tension is so light that it will not of itself move the record when the latter is adjusted. When the record is to be removed, the finger 25 is turned over to the position shown by dotted lines in Fig. 3. In Figs. 4 and 5 I have shown this adjusting device on the record holder in a manner which will permit of a rather nicer adjustment, and in which the tendency of the spring 26 to slightly shift the adjustment is overcome to a great extent. The principle is the same, however, and in it I illustrate a split sleeve 29 which is supported on a short spoke 17^b of the record holder, and the rod 23^a which corresponds to the rod 23 already described, is moved in and out in this split or friction sleeve. For convenience the rod is provided with a handle 28 which can be a milled wheel. Near the outer end of the rod 23^a is a coiled spring 30, preferably doubled, and this has a terminal finger 31 which engages the end of the record 19, and like the finger 25, the finger 31 can be turned over with the rod 23^a so as to clear the record 19 when the latter is to be pushed on and off.

From the foregoing description it will be seen that when the engaging finger of the adjusting device is simply turned to one side, the record 19 can be readily slipped on and off the record holder, that the record holder as a whole can be instantly and nicely adjusted by simply grasping the handle 20 and moving it in or out on its spindle 12, and that a still nicer adjustment can be effected by moving the record on the record holder. Further, that the spring fingers 25 or 31 serve to hold the record against any displacement, and that the ends of the record are left entirely clear except for the slight bearing of the spring finger referred to. It will also be noticed that the record holder can be applied to any type of multiple phonograph or even to a single record machine, if desired.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent:—

1. A record holder comprising a supporting shaft, a spider having a central sleeve to slide on the shaft, and longitudinal ribs rigidly connected with the sleeve and fitting the walls of a record, a friction device securing the sleeve slidably on the shaft, and an auxiliary yielding tension device arranged longitudinally of the spider and engaging one end of the record.

2. A record holder comprising a supporting shaft, a rigid spider having ribs to engage the wall of a record, and a sleeve to slide on the shaft, a friction spring secured to the spider and engaging the shaft, a sliding tension rod mounted on the spider and engaging one end of the record, and a spring having less tension than the first mentioned spring connecting the tension rod with the spider.

3. A record holder, comprising a supporting shaft, a rigid spider longitudinally movable thereon, and in frictional engagement therewith, said spider being adapted to engage the inner wall of a cylindrical record, and a spring-pressed tension rod arranged longitudinally in the spider and adapted to turn on its axis, said rod having a finger to engage the end of a record.

JULIUS ROEVER.

Witnesses:

WARREN B. HUTCHINSON,
FRANK L. STUBBS.

W. ZEYSING.
BRAKE FOR DISK TALKING MACHINES.
APPLICATION FILED JUNE 22, 1907.

Patented May 31, 1910.
2 SHEETS—SHEET 1.

959,682.

Fig. 1.

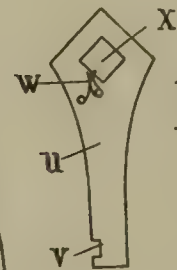
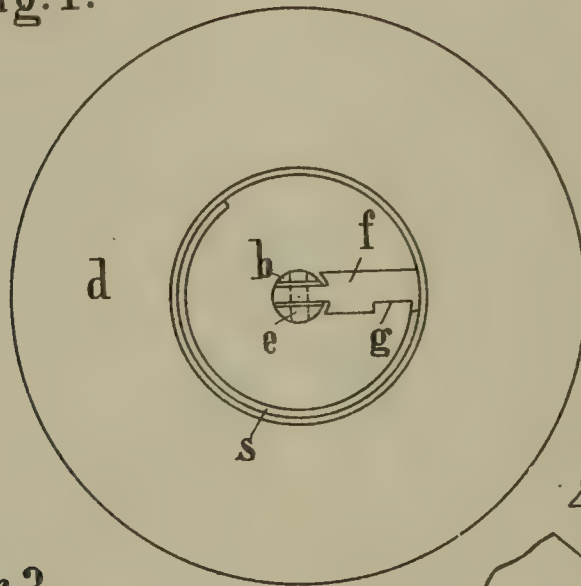


Fig. 5.

Fig. 4.

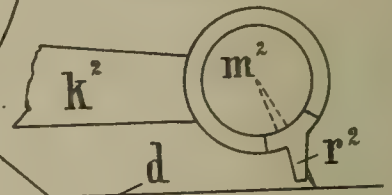


Fig. 3.

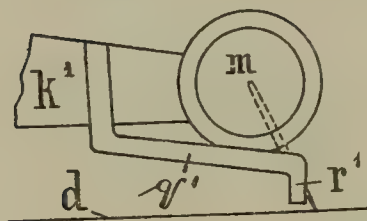
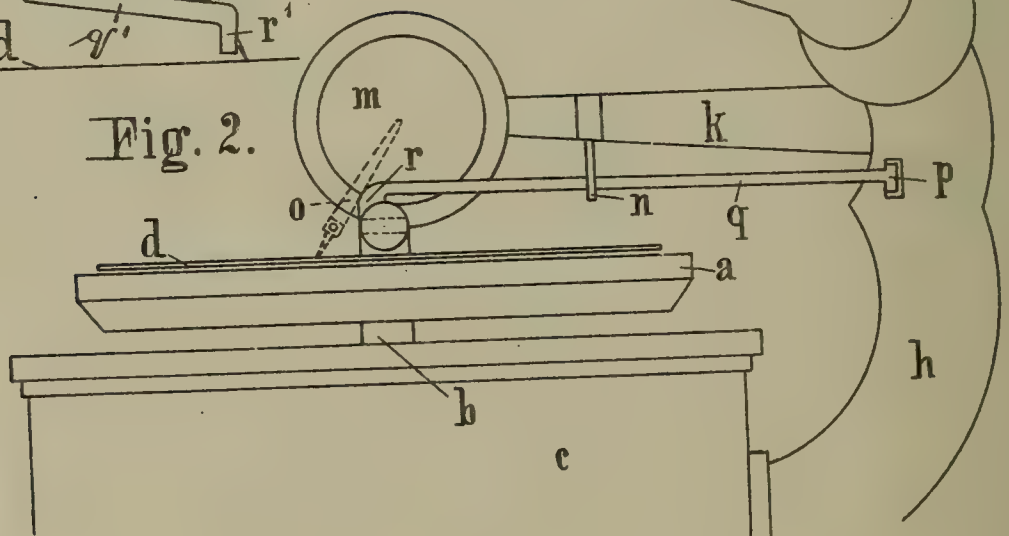
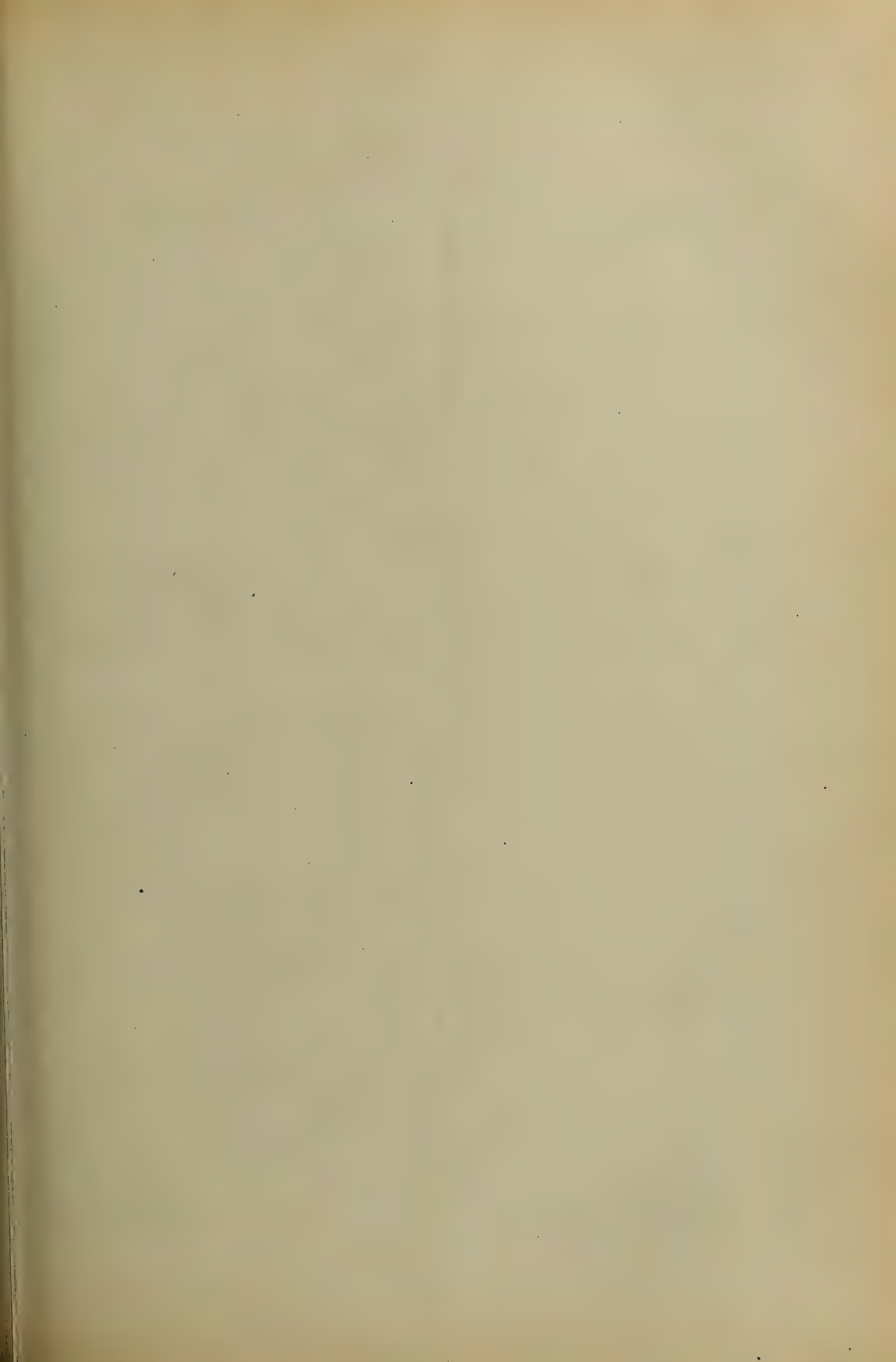


Fig. 2.



Witnesses:
William C. Schilling
Karl Topet

Inventor:
Walter Zeysing



W. ZEYSING.
BRAKE FOR DISK TALKING MACHINES.
APPLICATION FILED JUNE 22, 1907.

959,682.

Patented May 31, 1910.

2 SHEETS—SHEET 2.

Fig. 6.

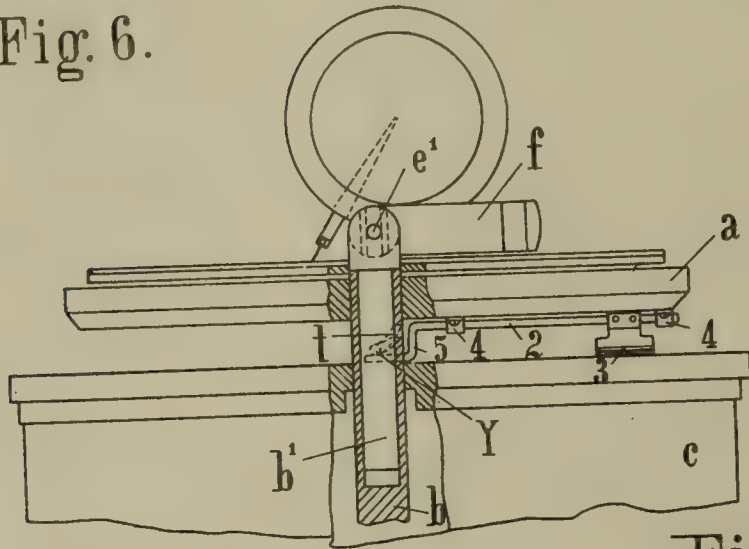


Fig. 7.

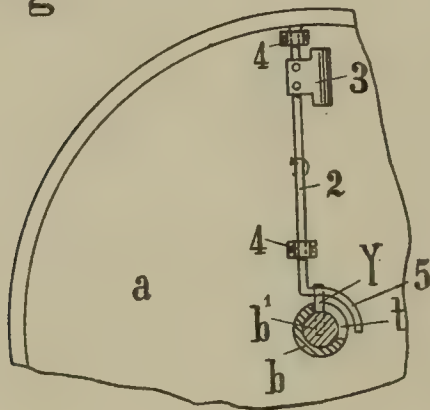


Fig. 8.

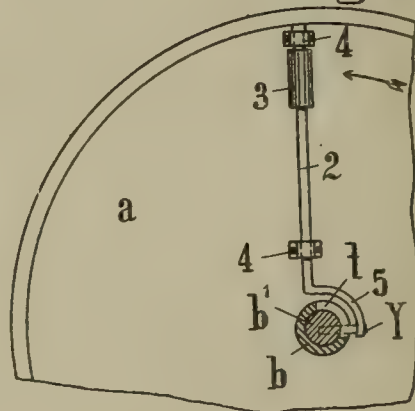


Fig. 9.

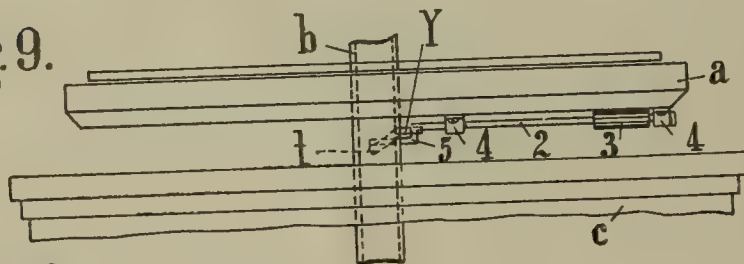
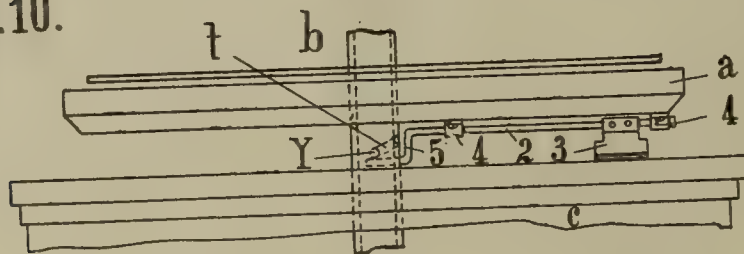


Fig. 10.



Witnesses:
William D. Schilling
Karl Topel.

Inventor:

Walter Zeysing

UNITED STATES PATENT OFFICE.

WALTER ZEYSING, OF STETTIN, GERMANY.

BRAKE FOR DISK TALKING-MACHINES.

959,682.

Specification of Letters Patent.

Patented May 31, 1910.

Application filed June 22, 1907. Serial No. 380,343.

To all whom it may concern:

Be it known that I, WALTER ZEYSING, merchant, a subject of the King of Prussia and German Emperor, residing at Stettin, in the county of Pommern and Empire of Germany, have invented certain new and useful Improvements in Brakes for Disk Talking-Machines, of which the following is a specification.

My invention relates to improvements in disk-talking machines of that class, in which the disk-record is automatically stopped at the completion of each reproduction. To accomplish such automatic stopping, the style running in the record-grooves of the disk is made to enter at the proper time into an empty or dead-groove specially provided, whereby the diaphragm-carrier is lowered as it approaches the center of the disk. By lowering the arm of the diaphragm carrier, the revolving motion of the disk-carrier will be stopped through the agency of brake-mechanism actuated from the diaphragm carrier in its lowered position. The disk-carrier may be rotated in any known manner.

To make my invention properly understood, I have illustrated the same in the accompanying drawings, in which:

Figure 1 is a plan of the record-disk with its empty or dead groove, the driving spindle and the arm carried at the top of the same. Fig. 2 is a side-elevation of the casing, the disk-carrier and record-disk, the diaphragm and diaphragm-holder, the horn with its supporting bracket, and an arm attached to the diaphragm-holder, said arm being destined to engage the arm on top of the disk-spindle. Fig. 3 is a view showing another modification of the means for holding the arm carried by the diaphragm holder. Fig. 4 is a view showing the diaphragm carrying an arm for engaging the arm on the disk-spindle. Fig. 5 is a plan of another modification of the arm secured to the top of the disk-spindle. Fig. 6 is a side-elevation, partly in section, of a portion of the casing, the disk-carrier and record-disk with the driving spindle and brake-mechanism actuated by the same. Fig. 7 is an underside view of a portion of the disk-carrier, with the brake-lever attached thereto, the brake-arm being shown in the raised or inoperative position. Fig. 8 is an under-

side view similar to Fig. 7, with the brake-arm shown in the operative position. Figs. 9, and 10, are, respectively, a side elevation of Figs. 7, and 8.

Referring to Figs. 1, and 2, an arm *f*, is hinged to the upper end of the spindle *b*, of the disk-carrier *a*; the said arm, normally, extends at right angles to the said spindle *b*, but it may be raised in line with said spindle in order to strip the disk *d*, off and put another disk on. The mode of securing the said arm *f*, to the spindle *b*, is not essential; it might be removably placed with a square hole on to a square portion at the top of spindle *b*, and held engaged there against accidental shifting by a spring-pawl *w*, *x*, as shown in Fig. 5. The said arm, in Fig. 5, is designated by the reference-letter *u*. Any other means for securing the said arm to the spindle *b*, might be employed, to make said arm follow the rotary motion of the spindle and for allowing the disk *d* to be stripped off the spindle.

The means for imparting rotary motion to the spindle *b*, and to the disk-carrier *a*, mounted on said spindle, are contained in the casing *c*, in the usual manner. To the said casing *c*, is secured the bracket *h*, carrying the horn *i*, and to said horn is attached the diaphragm-lever *k*, in the usual manner. The said arm *f* has a recess *g*, adapted to be engaged by the hook *r* of a lever *q*, which has a sliding engagement as at *p*, with the bracket *h*, and is supported by a fork or yoke *n*, carried by the diaphragm-lever *k*, the said fork or yoke making the said arm *q* follow the motions of said diaphragm-lever *k*, with sufficient play in the vertical direction for allowing the hook-shaped end *r*, to descend into the recess *g*, of the arm *f*.

In the modification illustrated by Fig. 5, *u*, is the arm to be secured by a square hole on a square top of the spindle *b*, and to be held there by a pawl *x*, under the pressure of a spring *w*; *v*, is the notch or recess to be engaged by the hook *r* of lever *q*.

According to the modification shown in Fig. 3, the hook *r*, is replaced by a hook *r*¹ formed at the end of an arm *q*¹, rigidly secured to the diaphragm-carrier *k*¹, and according to another modification illustrated by Fig. 4, the said hook to enter the recess of the arm is formed by the projecting pin

or finger r^2 secured or formed to the periphery of the diaphragm m^2 , carried by the supporting arm k^2 .

As soon as the hook-shaped end r of arm g , engages the recess g of arm f , on spindle b , it will stop the rotary motion of said spindle b . But stopping motion by such engagement alone would put a very heavy strain upon the arm f , and spindle b , and the driving mechanism imparting motion to said spindle. I, therefore, prefer to employ a brake-mechanism for gradually and smoothly stopping the motion. To obtain such braking, the upper portion of the spindle b is made hollow and within the bore is lodged a central stem b^1 , the upper end of which projects from the hollow spindle b , and carries the arm f hinged or removably secured to it, as before described. The said stem b^1 has a pin y , fixed to it and projecting laterally through a spiral slot t , in the side of the hollow spindle b , thereby coupling the stem to the spindle, as the latter is being rotated by the driving gear in the casing c . The said spiral slot extends to about a quarter of the periphery of the spindle b . It will be seen, then, that, as the hook r engages the recess g of the arm f , motion will not be entirely stopped at once, but the pin y , of the stem b^1 will slide down in the slot t , and in its way down it will bear against an arm 5, or crank, of a shaft 2, carried in bearings 4 secured to the lower side of the disk-carrier a . To the said shaft 2, is mounted an eccentric lever or brake

arm 3, which, as the said shaft 2 is made to perform a partial turn, will come to act against the upper surface of the casing c .

I claim as my invention:

1. A talking-machine-brake mechanism comprising a disk record support, an axial support for said record support, upon which said record support rotates, a brake member for stopping the movement of said record support, a reproducer movable across said record support toward said axial support, a brake controlling member associated with said axial support, and means movable across said record support with said reproducer for causing the actuation of said brake member through said brake controlling member.

2. In a talking machine, the combination, with the disk-carrier, of a hollow central spindle to rotate the same, a spiral slot provided in said hollow spindle, a central stem located within the hollow spindle, a pin projecting from said central stem through the spiral slot, a brake lever under control of said projecting pin, an arm mounted to the said central stem, and an arm connected to the diaphragm-carrier and adapted to engage the said arm on the central stem, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two witnesses.

WALTER ZEYSING.

Witnesses:

FRIEDA ZEYSING,
HANS HILDEBRAND.

F. KANE.
DIAPHRAGM FOR TALKING MACHINES.
APPLICATION FILED JULY 23, 1907. RENEWED JAN. 10, 1910.

960,021.

Patented May 31, 1910.

Fig. 1.

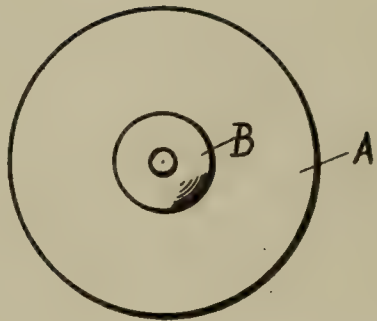
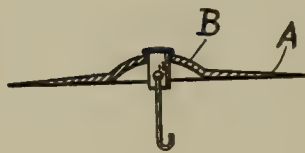


Fig. 2.



WITNESSES

S. M. Gallagher.
A. J. Williamson

INVENTOR

Frank Kane

BY

W. Preston Williamson ATTORNEY

UNITED STATES PATENT OFFICE.

FRANK KANE, OF TACONY, PENNSYLVANIA.

DIAPHRAGM FOR TALKING-MACHINES.

960,021.

Specification of Letters Patent.

Patented May 31, 1910.

Application filed July 23, 1907, Serial No. 385,203. Renewed January 10, 1910. Serial No. 537,339.

To all whom it may concern:

Be it known that I, FRANK KANE, a citizen of the United States, residing at Tacony, county of Philadelphia, and State of Pennsylvania, have invented a certain new and useful Improvement in Diaphragms for Talking-Machines, of which the following is a specification.

My invention relates to a new and useful improvement in diaphragms for talking machines, and has for its object to so construct a diaphragm as to enable it to reproduce with greater accuracy the various sounds, such as singing, talking and the tones of all kinds of musical instruments and to prevent the harsh metallic sound heretofore incident to the reproduction by such machines.

With these ends in view, this invention consists in the details of construction and combination of elements hereinafter set forth and then specifically designated by the claim.

In order that those skilled in the art to which this invention appertains may understand how to make and use the same, I will describe its construction in detail, referring by letter to the accompanying drawing forming a part of this specification, in which—

Figure 1 is a plan view of my improved diaphragm, and Fig. 2, a central section thereof.

In carrying out my invention as here embodied I make a diaphragm of a composition of metal consisting of two parts of copper and one part of spelter, the horizontal portion A of which varies in thickness from its outer diameter which is very thin to the central or cupped portion B where it is much thicker and by thus varying the thickness of the diaphragm I provide for the reproduction of various tones and volume of sound,

and the cupped portion B acts as a reservoir for the sound waves to increase their volume.

I am aware that diaphragms have been made of copper, but in practice such diaphragms give out a harsh metallic sound, and while fairly reproducing the sound waves of a drum or heavy wind instruments it does not accurately produce the sounds of a stringed instrument, such as a banjo, nor does it accurately reproduce the various tones of the human voice, whereas my diaphragm will accurately reproduce all of the various sounds separately or at the same time making it especially applicable to the reproduction of the sounds of an orchestra together with singing.

One of the advantages of the concave portion B of the diaphragm is that it houses the sound vibrations from the record, thus giving a clearer tone to the sounds issuing from the horn, and it also strengthens the diaphragm, and as the latter is made of metal it is very durable.

Having thus fully described my invention, what I claim as new and useful, is—

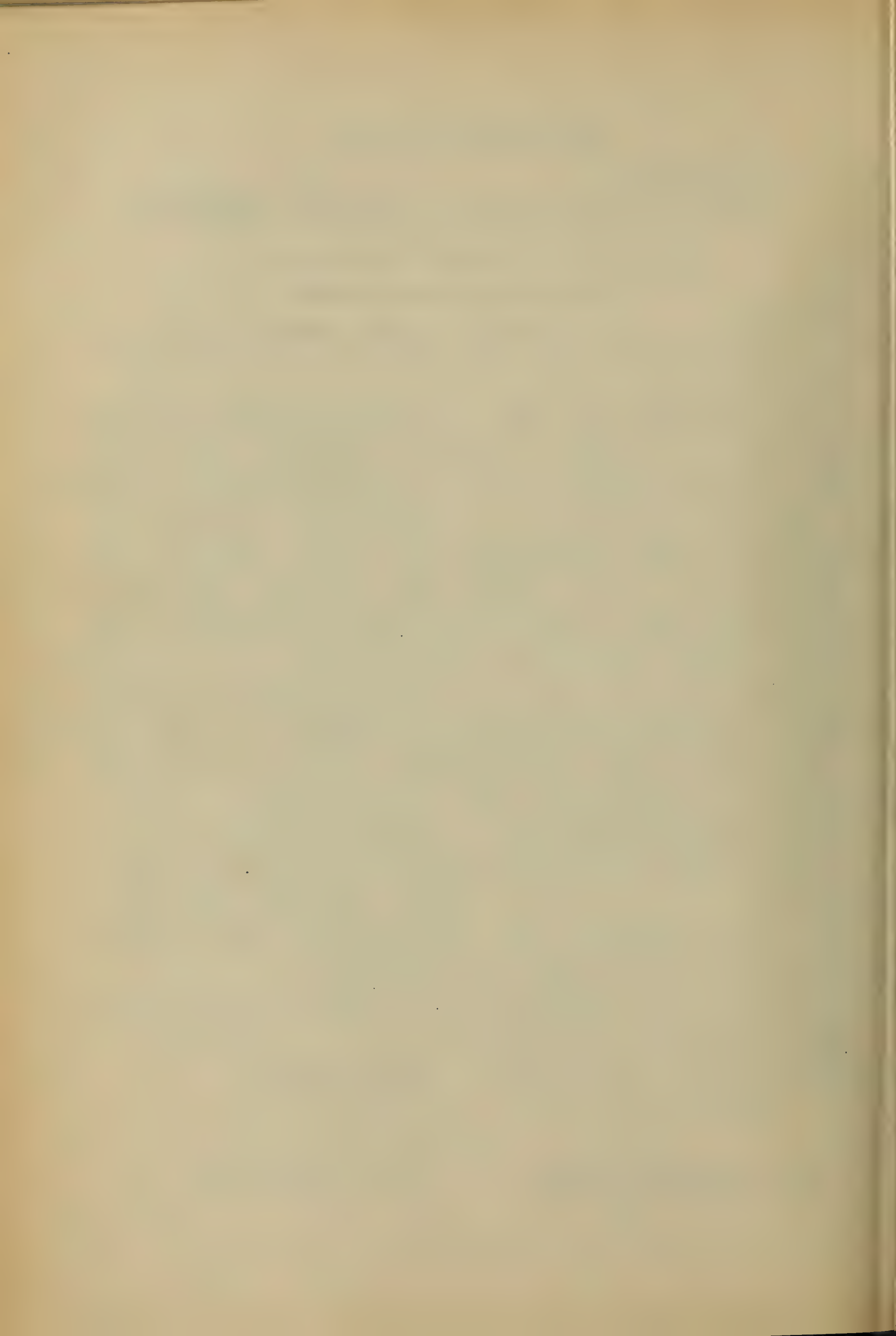
A diaphragm composed of a central cupped portion of uniform thickness and a horizontal disk like portion being of greatest thickness at the periphery of said cupped portion and thence gradually decreasing in thickness and tapering to the periphery of said disk-like portion which is of least and wafer like thickness.

In testimony whereof, I have hereunto affixed my signature in the presence of two subscribing witnesses.

FRANK KANE.

Witnesses:

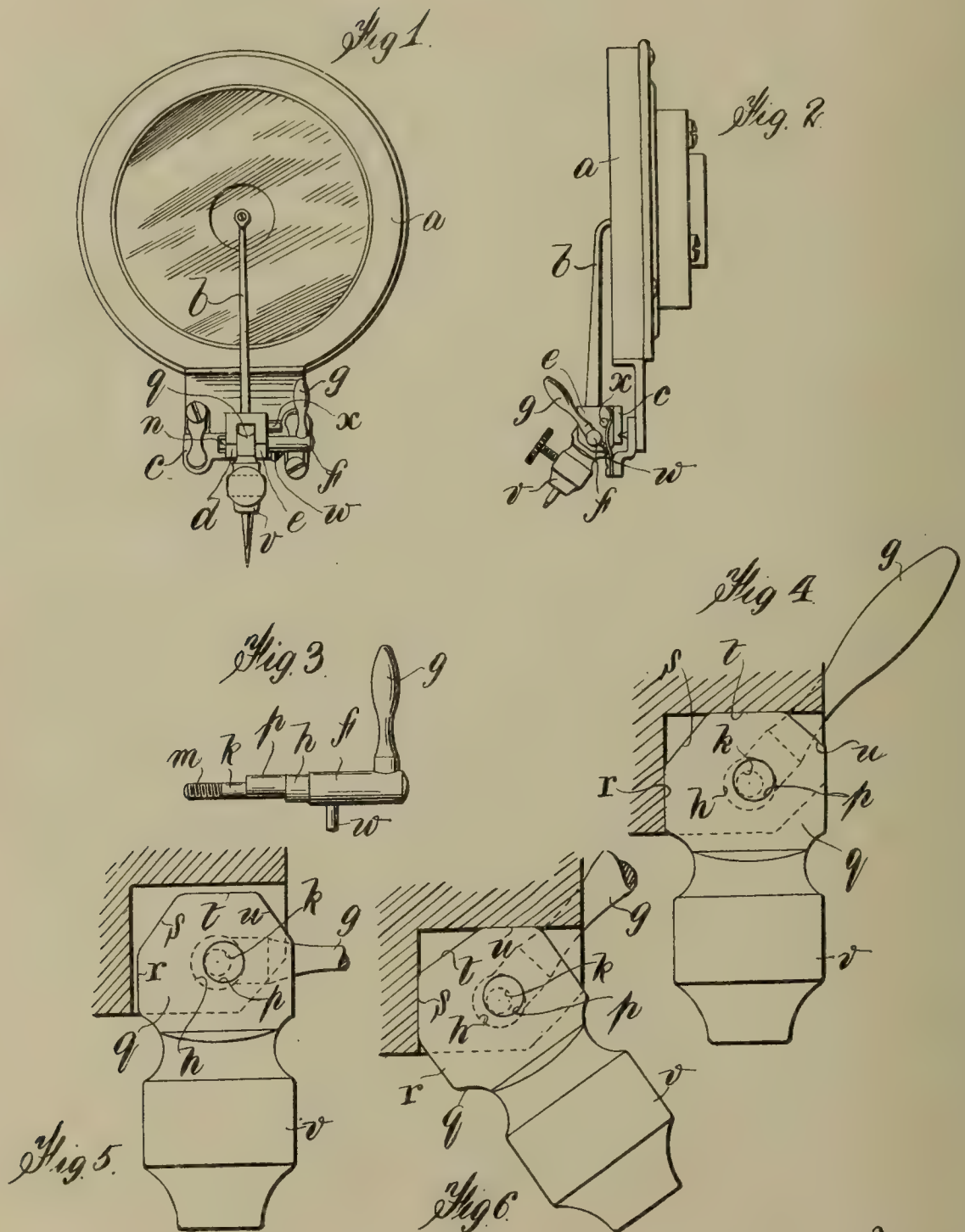
W. C. BURKHOLDER,
J. H. CURRIER.



P. J. PACKMAN.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED JULY 24, 1909.

960,191.

Patented May 31, 1910.



Witnesses
F. R. Fulton
J. S. Winston.

Inventor
Percival J. Packman
By *William John Wetherburn*
his Atty.

UNITED STATES PATENT OFFICE.

PERCIVAL JAMES PACKMAN, OF HIGHBURY, LONDON, ENGLAND.

SOUND-BOX FOR TALKING-MACHINES.

960,191.

Specification of Letters Patent.

Patented May 31, 1910.

Application filed July 24, 1909. Serial No. 509,363.

To all whom it may concern:

Be it known that I, PERCIVAL JAMES PACKMAN, a subject of the King of England, residing at 66 Hamilton road, Highbury, in the county of London, England, have invented certain new and useful Improvements in Sound-Boxes for Talking-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a sound box for disk talking machines, and has for its object to provide a sound box which can be used either for reproducing from a so-called hill and dale or phonograph cut record or a zig-zag or Berliner cut record, and which can be easily and rapidly converted and brought into the correct position for playing from either of such records.

According to this invention, I mount the stylus holder in connection with the stylus bar in or on suitable bearings so that the stylus can be brought either into a plane parallel to the plane of the diaphragm for playing from zig-zag records, or into a position inclined at a suitable angle to the said diaphragm for reproduction from hill and dale cut records, and I provide means for changing the position of the needle or stylus holder with great facility and for locking it in either of the required positions.

The accompanying drawing shows, by way of example, one method of carrying out my invention.

Figure 1 is a front elevation of a sound box fitted with a needle for reproducing from a zig-zag record. Fig. 2 is a side elevation of the same sound box with the needle replaced by a sapphire point and the stylus holder brought into a suitable position for reproducing from hill and dale cut records. Fig. 3 shows enlarged view of a detail hereinafter referred to. Figs. 4 to 6 show partly diagrammatic views of details greatly enlarged.

The same letters of reference are employed to denote the same parts in all the views.

a is the shell of the sound box.

b is the stylus bar.

c is a plate carrying a double bearing bracket with side plates *d* and *e*, to which double bearing bracket the stylus bar *b* is suitably attached.

f is a spindle provided with a handle *g*. This spindle is prolonged into or has formed with it a smaller stepped portion *h* which fits into a corresponding circular hole in the side plate *e*.

k is another circular part somewhat smaller than the part *h* and placed concentrically to the parts *h* and *f*, and having its bearing in a circular hole in the plate *d*, the extremity of the spindle is provided with a screw thread at *m*, by means of which the spindle is secured in position by a suitable nut. Between the concentric parts *h* and *k* is another circular portion *p*, but formed or placed eccentrically with respect to these portions so as to form a kind of minute crank. Threaded on this portion *p* is a plate *q* shaped as shown in the drawing with faces *r*, *s*, *t* and *u* inclined to one another. This plate is formed in one with the stylus or needle holder *v*.

w is a pin on the spindle *f* and *x* is a stop on the side plate *e*. The plate *c* is mounted on suitable bearings and provided with suitable spring devices all of the ordinary construction.

The action of the device will be readily understood:—Assuming the parts are in the position shown at Fig. 1 and it is required to bring them into the position shown at Fig. 2 for use for reproduction from hill and dale cut records, it will be observed that the surfaces *r* and *t* are held tightly against the side and top of the double bearing, so that the needle holder is held firmly in position. Now when the handle *g* is depressed the effect is to lower the plate *q* and stylus holder *v*, thus drawing the surface *t* away from the top plate. At the same time the crank-like movement of the eccentric portion *p* draws the surface *r* away from the side plate. It will now be seen that the needle holder and plate *u* can be turned around into an angular position and then when the handle *g* is again pushed up the face *u* comes against the top surface and the face *s* against the side surface, thus locking the needle holder and plate in the new position, that is the exact correct position for reproducing from a hill and dale record, the surfaces being suitably cut on the plate *q* for this purpose. The downward movement of the lever *g* is stopped by the pin *w* coming against the stop *x*.

It will be observed that the present construction involves advantages over my Brit-

ish Patent Number 7479 of 1907, in that the lever *g* locks the stylus by an upward jamming movement away from the record and in the exact positions for playing both kinds of records, while in the patent above it was necessary to slightly unscrew the stylus holder and then to turn it together with the plate on which it was secured about a center, and then to screw up tight the said holder. In these operations one was liable to get the stylus in an incorrect position. Furthermore, the screw for tightening the needle was liable after use to give trouble, which liability is entirely overcome by providing the construction now disclosed; and by moving the lever *g* away from the record all liability of touching the latter is obviated.

It will be understood that the foregoing description merely shows one way of carrying out my invention as the details and method of application of my invention may be varied largely to suit requirements without departing from the principle thereof.

What I claim and desire to secure by Letters Patent of the United States of America is:—

1. In a sound box provided with a shell containing a diaphragm; the combination of a stylus bar having a double bearing; a spindle provided with an eccentric working in said bearing; and a lever rigid with said

spindle adapted to lock said stylus in two different positions upon moving the same in a direction away from the record over which said stylus plays, substantially as described.

2. A sound box comprising a shell containing a diaphragm, a stylus bar, a double bearing attached to said stylus bar, a spindle provided with an eccentric working in the said bearing, a plate on the said spindle carrying the stylus holder and means comprising a lever for locking the plate and stylus holder in either of two positions for the purpose set forth.

3. A sound box comprising a shell containing a diaphragm, a stylus bar, a double bearing attached to said stylus bar, a spindle working in the said bearing, the said spindle having an eccentric portion coming between the bearing plates, such eccentric portion passing through a plate carrying the stylus holder, such plate being provided with two pairs of surfaces inclined to one another in such a way that by actuating a suitable handle the plate and stylus holder can be locked in either of two required positions substantially as and for the purpose set forth.

In testimony whereof, I affix my signature, in presence of two witnesses.

PERCIVAL JAMES PACKMAN.

Witnesses:

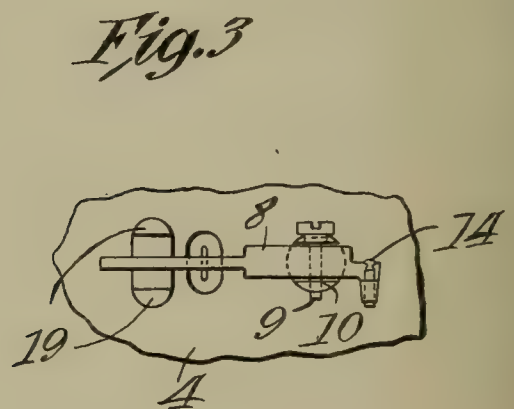
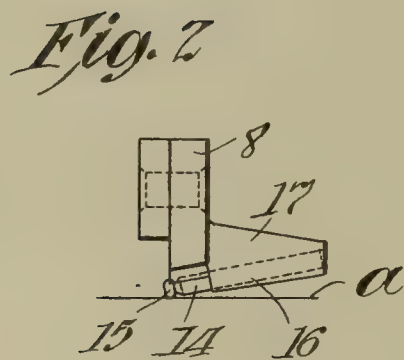
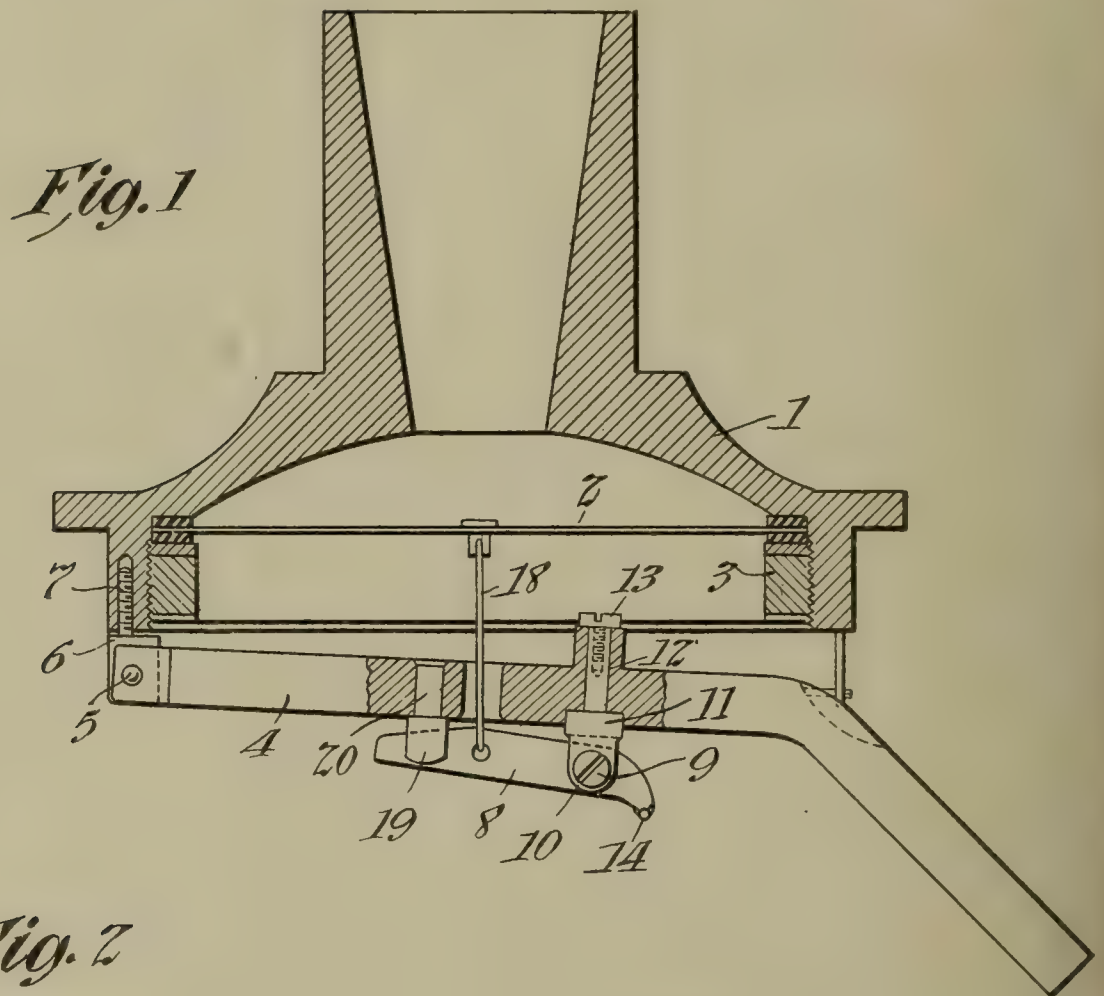
A. E. VIDAL,
L. SIMMONDS.

P. WEBER.
PHONOGRAPH REPRODUCER.

APPLICATION FILED MAY 3, 1910.

Reissued June 7, 1910.

13,120.



Witnesses:
Frank D. Lewis
Delos Holden

Inventor:
Peter Weber
by Frank L. Lewis
Att.

UNITED STATES PATENT OFFICE.

PETER WEBER, OF ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH-REPRODUCER.

13,120.

Specification of Reissued Letters Patent. Reissued June 7, 1910.

Original No. 951,496, dated March 8, 1910, Serial No. 456,701. Application for reissue filed May 3, 1910.
Serial No. 559,428.

To all whom it may concern:

Be it known that I, PETER WEBER, a citizen of the United States, and a resident of Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Reproducers, of which the following is a description.

My invention relates to phonograph reproducers, and has for its object the provision of an improved stylus and mounting therefor, adapted more particularly for use with records in which the pitch of the record groove is one two-hundredth ($1/200$) of an inch. In order to properly track records of this character as now on the market it is necessary that the reproducer stylus be of microscopic size, since the record groove is formed by a stylus having a curved cutting edge, the diameter of which is only .008 of an inch. The reproducer stylus should have a rounded surface and should be so shaped as not to cause undue wear upon the record. It should also be supported in such a manner as to be capable of lateral movement, so that it will track the record groove properly; and it is also desirable that the stylus should be so connected to the diaphragm that the vertical movement of the stylus will be magnified, so as to produce an amplified movement of that portion of the diaphragm to which it is connected. These advantages are secured by the structure herein described and claimed.

In order that my invention may be more clearly understood, reference is hereby made to the accompanying drawing, of which—

Figure 1 is a side elevation, partly in section, of a phonograph reproducer constructed in accordance with my invention; Fig. 2 is an end view, showing the stylus lever and stylus carried thereby in operative position with respect to the record surface, and Fig. 3 is a bottom plan view of the same and of the adjacent portion of the floating weight.

The reproducer shown comprises a sound box body 1 of usual form, within which the diaphragm 2 is clamped by the ring 3. The floating weight 4 is pivoted in the usual manner at 5 to the pivot block 6, supported by the screw 7, which is threaded within the body 1. The stylus lever 8 is pivoted on the screw 9, which is threaded within the lugs

10, depending from the member 11. The latter has an integral pin 12, rotatably mounted in the floating weight and supported by the screw 13 threaded within the end of said pin. This pin turns freely about its axis, and thereby permits lateral movement of the stylus 14 with respect to the record surface. This stylus, as shown, is formed with a button-shaped head 15 and a cylindrical shank 16, which is secured to a socket formed in the ear 17, which is integral with the lever 8. The shank 16 occupies an inclined position with respect to the record surface *a* (see Fig. 2). The radius of curvature of the head 15 of the stylus 14 in a plane transverse to the record groove is much smaller than the radius of curvature of the head in a plane parallel with the record groove. The bearing surface of the head is therefore narrow in a lateral direction whereby it is able to track the bottom of the record groove at all times, and it is comparatively broad in the direction along the record groove, whereby the tendency of the stylus to cut into or unduly wear the record surface is greatly reduced. A stylus of this shape having a bearing surface in which the diameters along and across the record groove are respectively .016 and .008 inch will track in a perfect manner a record of the type previously referred to without undue wear and is of such size that it can be readily handled and inspected by workmen in its various stages of manufacture, and can be produced by ordinary manufacturing processes and by workmen of ordinary skill.

There is a link 18 applied in the usual manner to the center of the diaphragm 2, and the lower end of the same is connected to the stylus lever 8 at a distance from its fulcrum which is considerably greater than the distance of the stylus 14 from the said fulcrum, whereby the movements of the stylus are exaggerated or amplified in their transmission to the center of the diaphragm. The angular movement of the lever 8 about the axis of the pin 12 is limited by a pair of stops 19 which depend from the pin 20, rigid with the floating weight 4.

Having now described my invention, what I claim is:

1. In a phonograph reproducer, a stylus formed with a surface curved upon differ-

ent radii and adapted to engage a record groove of a maximum width considerably less than .01 inch, and means for supporting the same in such a position that the radius of curvature in a plane parallel to the direction of said groove, is greater than the radius of curvature in a plane at right angles thereto, substantially as set forth.

2. In a phonograph reproducer, a stylus having a rounded engaging surface adapted to track the record groove and a shank, and means for supporting the same in such a position that the shank extends transversely to the tangent to every record groove at the point contacted by the engaging surface of the stylus at any instant, substantially as set forth.

3. In a phonograph reproducer, a stylus having a rounded engaging surface adapted to track the record groove and a shank, and means for supporting the same in such a position that the shank extends substantially at right angles to the tangent to the record groove at the point contacted by the engaging surface of the stylus at any instant, substantially as set forth.

4. In a phonograph reproducer, a stylus having a rounded engaging head adapted to engage the record groove and a shank, and means for supporting the same in such a position that the shank extends transversely to the tangent to every record groove at the point contacted by the engaging surface of the stylus at any instant and is inclined upwardly with respect to the record surface at said point, substantially as set forth.

5. A reproducer stylus having a bearing surface curved in a plane transverse to the record groove on a radius sufficiently small to enable it to engage a record groove of circular cross-section and of a maximum width of not greater than .005 inch and curved on a substantially greater radius in a plane at right angles to said first plane, substantially as set forth.

6. In a phonograph reproducer, a stylus formed with a surface curved upon different radii and adapted to engage the record groove, and means for supporting the same in such a position that the radius of curva-

ture in a plane parallel to the direction of said groove is greater than the radius of curvature in a plane at right angles thereto, a diaphragm, and an amplifying connection between said stylus and diaphragm, substantially as set forth.

7. In a phonograph reproducer, the combination of a stylus comprising a shank having at one end a rounded disk-shaped head at right angles thereto, the periphery of the disk being curved in a direction transverse to its diameter on a curve the radius of which is less than the radius of the disk, and a stylus lever having a boss at right angles to the length thereof provided with a socket for receiving the said shank, substantially as set forth.

8. As an article of manufacture, a stylus lever provided with a socket extending transversely to the plane of the lever and adapted to receive a stylus.

9. As an article of manufacture, a stylus lever having an extension transverse to the plane of said lever and provided with a socket adapted to receive a stylus.

10. As an article of manufacture, a stylus lever having an extension approximately at right angles to the plane thereof provided with a longitudinal socket adapted to receive a stylus.

11. In combination, a diaphragm, a stylus lever provided with means to support a stylus approximately at right angles to the plane thereof, means to support said lever, and means to connect said lever to said diaphragm in such a manner that the movements of the free end of the lever are exaggerated in their transmission to said diaphragm.

12. As an article of manufacture, a stylus lever and a stylus extending therefrom transversely to the plane thereof and having its bearing surface substantially in said plane, substantially as set forth.

This specification signed and witnessed this 30th day of Sept. 1908.

PETER WEBER.

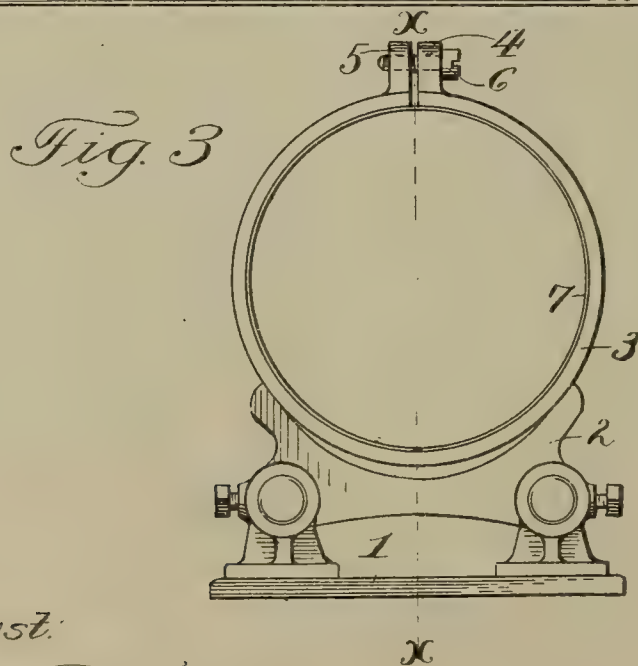
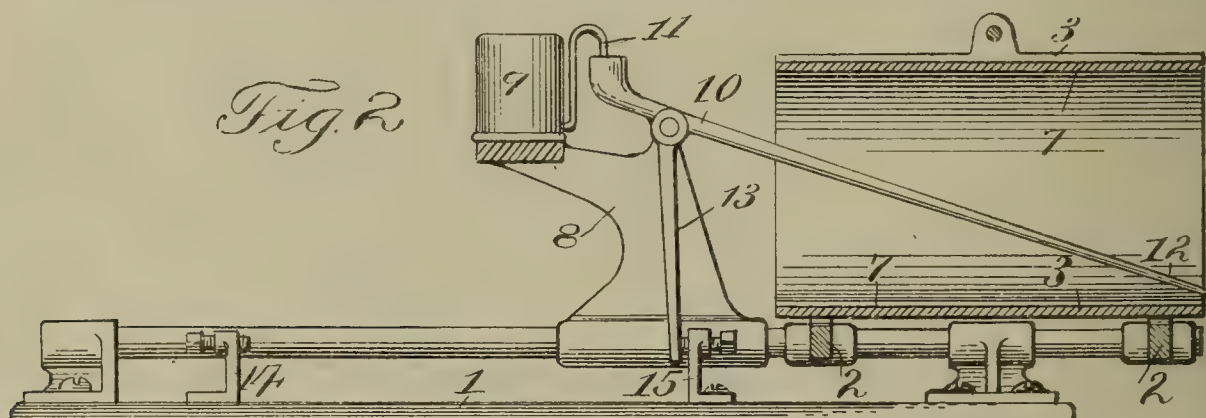
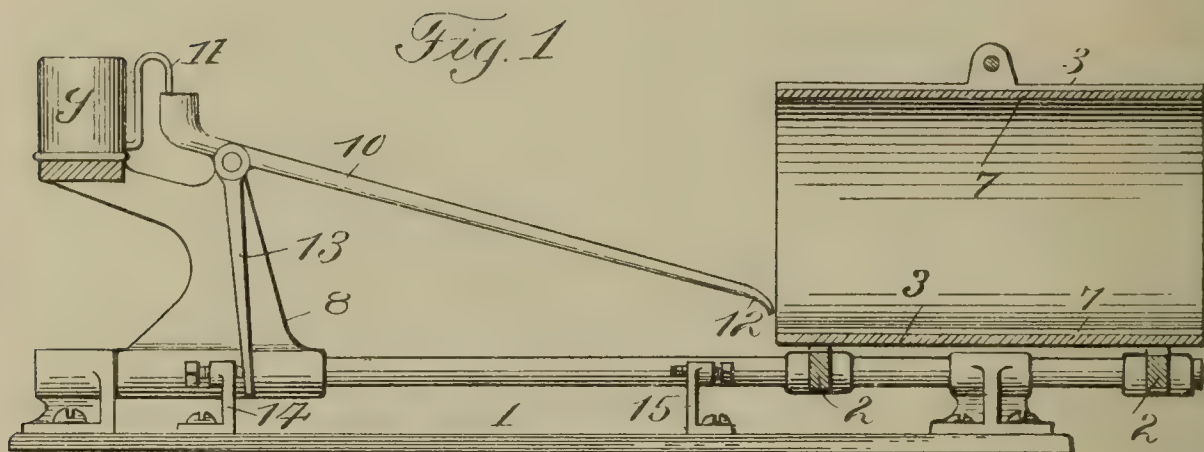
Witnesses:

JOHN M. CANFIELD,
FRANK D. LEWIS.

V. M. HARRIS.
MANUFACTURE OF PHONOGRAPH RECORD BLANKS.
APPLICATION FILED SEPT. 18, 1908.

960,320.

Patented June 7, 1910.



Attest:
J. C. Turner
pro. T. Oberlin.

Inventor:
Vernon M. Harris
by *J. B. Fay*
Attorney.

UNITED STATES PATENT OFFICE.

VARIAN M. HARRIS, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNITED STATES PHONOGRAPH COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

MANUFACTURE OF PHONOGRAPH-RECORD BLANKS.

960,320.

Specification of Letters Patent.

Patented June 7, 1910.

Application filed September 18, 1908. Serial No. 453,634.

To all whom it may concern:

Be it known that I, VARIAN M. HARRIS, citizen of the United States, resident of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Manufacture of Phonograph-Record Blanks, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle so as to distinguish it from other inventions.

This invention relates to a process of forming phonograph record blanks from sheets of celluloid, and has for its object to provide a simple and efficient process of joining the abutting ends of the sheets of celluloid in a strong and permanent manner, the process being more especially adapted for joining a sheet of the material bent into a tubular form, and so held while abutting ends are joined together to form a tubular phonograph record blank, equal in all respects to the drawn tubes or cylinders heretofore used in the manufacture of phonograph records, all as will hereinafter more fully appear.

In the accompanying drawing illustrative of an apparatus adapted to practically carry on the present improved process: Figure 1 is a longitudinal section on line $x-x$, Fig. 3. Fig. 2 is a similar section with parts occupying a different operative position, and Fig. 3 is an end elevation.

Similar numerals of reference indicate like parts in the views.

Referring to the drawings, 1 represents a stationary slideway of any usual construction, and provided with suitable feet by which it is supported in a horizontal position upon a work bench or table.

2, are a plurality of saddle pieces secured in fixed relation to the slideway, and adapted to support the cylindrical work holder in proper position in the apparatus.

3, is the cylindrical work holder above referred to, and consisting of a cylindrical shell of metal, or other equivalent rigid material, slitted along its length to form the longitudinal opening or gap 4 in the wall of the holder as shown.

5 are ears upon the opposed edges of the gap 4, through which passes adjusting screw 6, by which an adjustment in the diameter of

the holder can be effected as required in the actual and continued use of the apparatus. 55

7, is the sheet of celluloid to be operated upon, and which is bent into cylindrical form, and inserted into the interior of the cylindrical holder 3, with the meeting edges and seam formed thereby, located at the underside of the blank celluloid cylinder so formed, and as shown more particularly in Fig. 2. 60

8, is a carriage sliding longitudinally on the slideway 1, and carrying a supply tank 9 in which is contained a supply of cementing fluid used in the practical operation of the apparatus, and which fluid will usually consist of a cellulose product dissolved in ether, or the other solvent likewise capable of dissolving the material composing the sheet 7. 70

10, is a fountain pen pivotally supported on the carriage 8, and having one end connected by a flexible tube 11, with the supply tank 9, while its other end is of an elongated form and ends in a capillary discharge point 12 through which the cementing fluid flows, as said point moves in contact with the work. 75

13, is a depending operating arm rigidly connected to the fountain pen 10, aforesaid. 80

14 and 15 are stationary stops arranged near the limit of the longitudinal travel of the carriage 9, in each direction, which stops are adapted to alternately contact with the arm 13, to raise the discharge point 12 from the work, at the ending of its active stroke, and in like manner depress said discharge point at the ending of its inactive stroke and previous to the beginning of the active stroke; such operations taking place in an automatic manner during the continued operation of the apparatus. 85 90

The operation of the present process in connection with the apparatus just described is as follows: A sheet of celluloid of the proper dimensions is bent into a cylindrical form and inserted in the interior of the cylindrical work holder 3, which is adjusted to the required diameter by the adjusting screws 6. The work holder is then placed in position on the saddle pieces 2, with the seam of the celluloid cylinder located at the lowermost point in the height of said cylinder as shown. The operator now moves the carriage 8 to bring the discharge point 105

12 of the fountain pen 10, to the rear end of the interior of the work and work holder, and as such position is reached the stop 15 contacts with arm 13 to automatically depress the discharge point 12 to an operative position. A return movement is now imparted to the carriage and the discharge point 12, is drawn along the longitudinal seam of the celluloid sheet 7 to deposit the cementing solution; with the ending of such active or return stroke of the carriage, the stop 14 contacts with the arm 13, to automatically raise the discharge point 12 into its normal inoperative position. The work holder with its contained cylinder of celluloid is now removed from the apparatus and stacked away to dry out, and is replaced by a succeeding holder and its contained sheet of celluloid, the system requiring a large number of counterpart work holders in the attainment of rapid and perfect work.

The apparatus herein described constituted the subject matter of my former application for Letters Patent Serial No. 338,729 filed October 13, 1906, and no claim is herein made to such apparatus. By the foregoing steps, however I am enabled not only to manufacture cylindrical phonograph record blanks of celluloid with greater expedition and corresponding decrease in cost, than by methods heretofore prevailing but actually to produce a much superior article; for it is essential to the taking of an accurate and faultless record on the blank, that its outer surface be as highly polished as possible. Such polishing is of course obtained in a much more perfect degree, as well as more easily, when the material is in sheet form than in the case of tubular articles. In my method of butt-welding the edges of the sheets together by exteriorly supporting the same and applying the solvent from within, I not only avoid any ridge or inequality, which would be fatal to the usefulness of the article for the purpose in hand, but I preserve the smooth exterior of the sheet, now become a cylinder, with such success, that it becomes impossible to detect in the finished article the original line of cleavage.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the process herein disclosed, provided the step or steps stated by any one of the following claims or the equivalent of such stated step or steps be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In the manufacture of phonograph record blanks, the steps which consist in forming a sheet of celluloid with edges at substantially right angles to the surface of the sheet, bringing two such edges together under pressure exerted transversely thereof,

and simultaneously effecting the softening and adhesion of such abutting edges.

2. In the manufacture of phonograph record blanks, the steps which consist in forming a sheet of celluloid with edges at substantially right angles to the surface of the sheet, bringing two opposite edges together and causing such edges to abut by pressing exteriorly on the sheet, and simultaneously effecting the softening and adhesion of the abutting edges.

3. In the manufacture of phonograph record blanks, the steps which consist in forming a sheet of celluloid with edges at substantially right angles to the surface of the sheet, bringing two opposite edges together and causing such edges to abut by pressing exteriorly on the sheet, and simultaneously applying a suitable solvent along such abutting edges, whereby their softening and adhesion is effected.

4. In the manufacture of phonograph record blanks, the steps which consist in forming a sheet of celluloid with edges at substantially right angles to the surface of the sheet, bringing two opposite edges together and causing such edges to abut by pressing exteriorly on the sheet, and simultaneously applying a suitable solvent along such edges from within, whereby their softening and adhesion is effected.

5. In the manufacture of phonograph record blanks, the steps which consist in forming a sheet of celluloid with edges at substantially right angles to the surface of the sheet, bringing two opposite edges together and causing such edges to abut by pressing exteriorly on the sheet, said sheet being horizontally disposed with such abutting edges located lowermost, and applying a suitable solvent along such edges from within, whereby their softening and adhesion is effected.

6. In the manufacture of phonograph record blanks, the steps which consist in forming a sheet of celluloid with edges at substantially right angles to the surface of the sheet, maintaining the sheet in substantially cylindrical form, causing the meeting edges to abut by pressing exteriorly on the cylinder, and simultaneously effecting the softening and adhesion of such abutting edges.

7. In the manufacture of phonograph record blanks, the steps which consist in forming a sheet of celluloid with edges at substantially right angles to the surface of the sheet, maintaining the sheet in substantially cylindrical form, causing the meeting edges to abut by pressing exteriorly on the cylinder, and applying a suitable solvent along such abutting edges, whereby their softening and adhesion is effected.

8. In the manufacture of phonograph record blanks, the steps which consist in forming a sheet of celluloid with edges at sub-

stantially right angles to the surface of the sheet, maintaining the sheet in substantially cylindrical form, causing the meeting edges to abut by pressing exteriorly on the sheet, and applying a suitable solvent along such edges from within, whereby their softening and adhesion is effected.

9. In the manufacture of phonograph record blanks, the steps which consist in forming a sheet of celluloid with edges at substantially right angles to the surface of the sheet, maintaining the sheet in substantially cylindrical form, causing the meeting edges to abut by pressing exteriorly on the cylinder, said cylinder being horizontally disposed with the abutting edges located lowermost, and applying a suitable solvent along such edges from within, whereby their softening and adhesion is effected.

10. In the manufacture of phonograph record blanks, the steps which consist in forming a sheet of celluloid with edges at substantially right angles to the surface of the sheet, maintaining the sheet in substantially cylindrical form, causing the meeting edges to abut by exteriorly pressing on the cylinder, exteriorly supporting such edges

by a smooth surface, and applying a suitable solvent along such edges from within, whereby their softening and adhesion is effected, and a smooth exterior surface preserved.

11. In the manufacture of phonograph record blanks, the steps which consist in forming a sheet of celluloid with edges substantially at right angles to the surface of the sheet, maintaining the sheet in substantially cylindrical form, causing the meeting edges to abut by pressing exteriorly on the cylinder, exteriorly supporting such edges by a smooth surface, said cylinder being horizontally disposed with such abutting edges located lowermost, and applying a suitable solvent along such edges from within, whereby their softening and adhesion is effected, and a smooth exterior surface preserved.

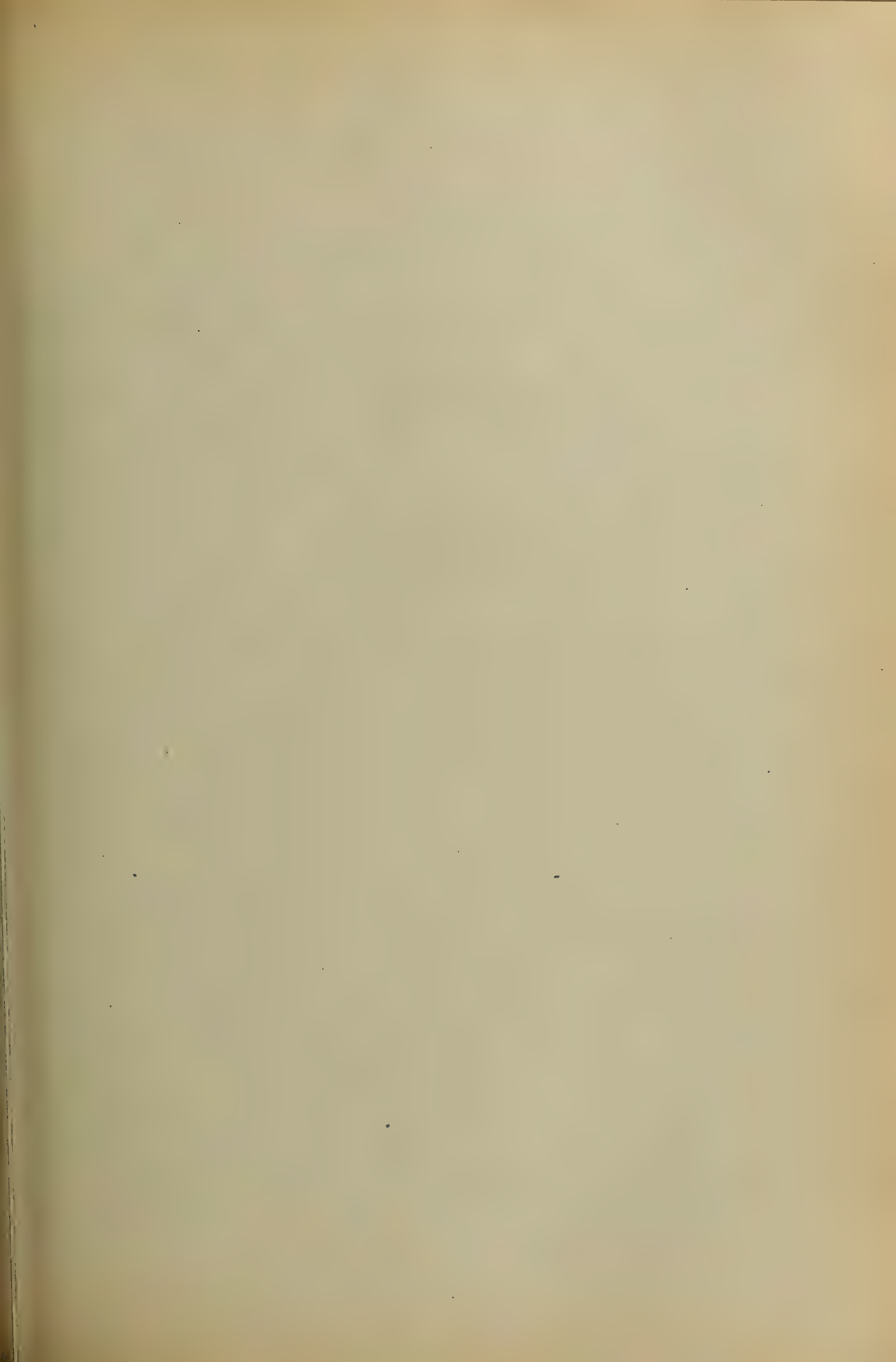
Signed by me this 15th day of September, 1908.

VARIAN M. HARRIS.

Attested by—

B. J. CAHR,
SIMEON STRAUS.





T. KRAEMER.
TALKING MACHINE.
APPLICATION FILED MAR. 10, 1909.

960,560.

Patented June 7, 1910.

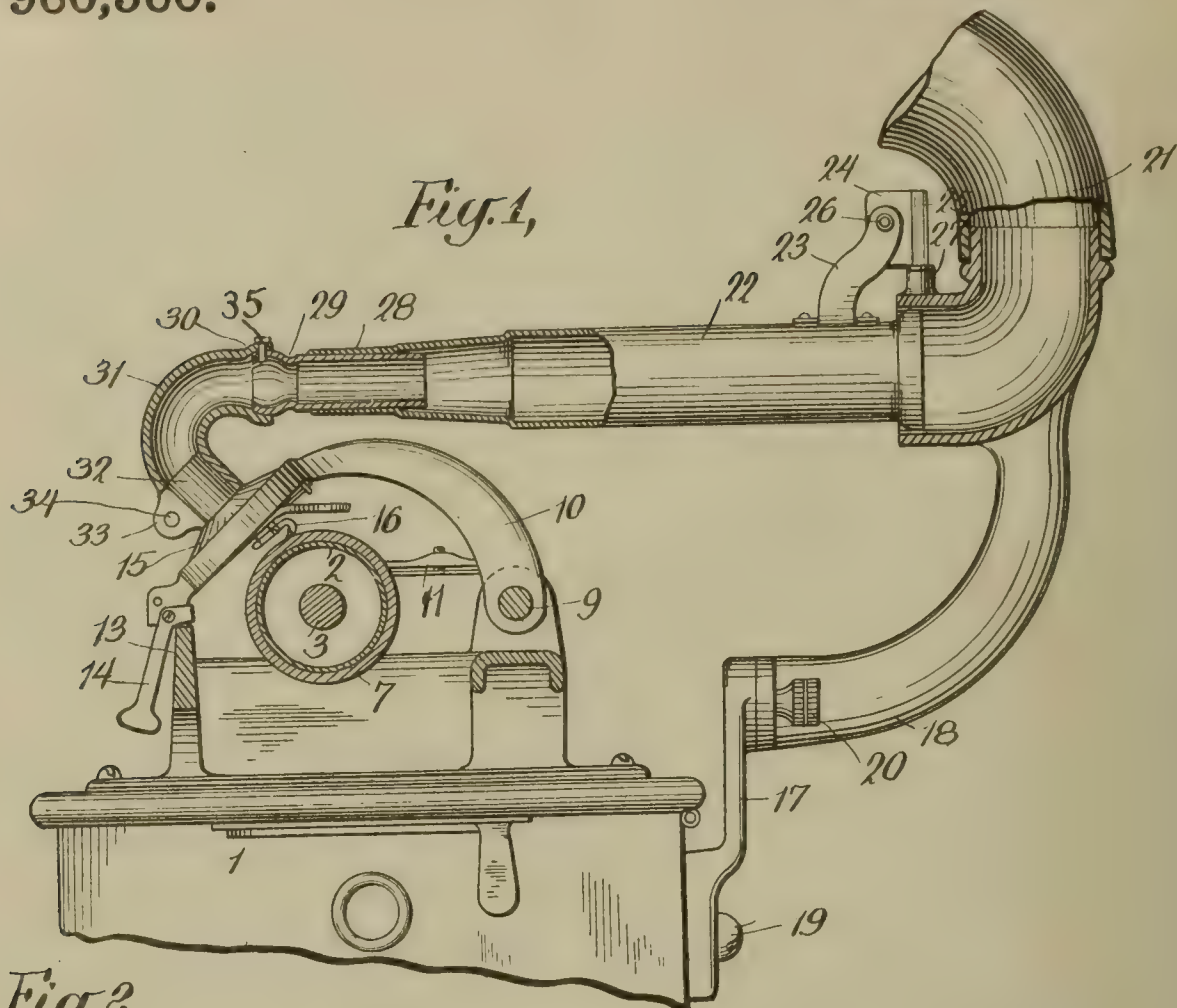
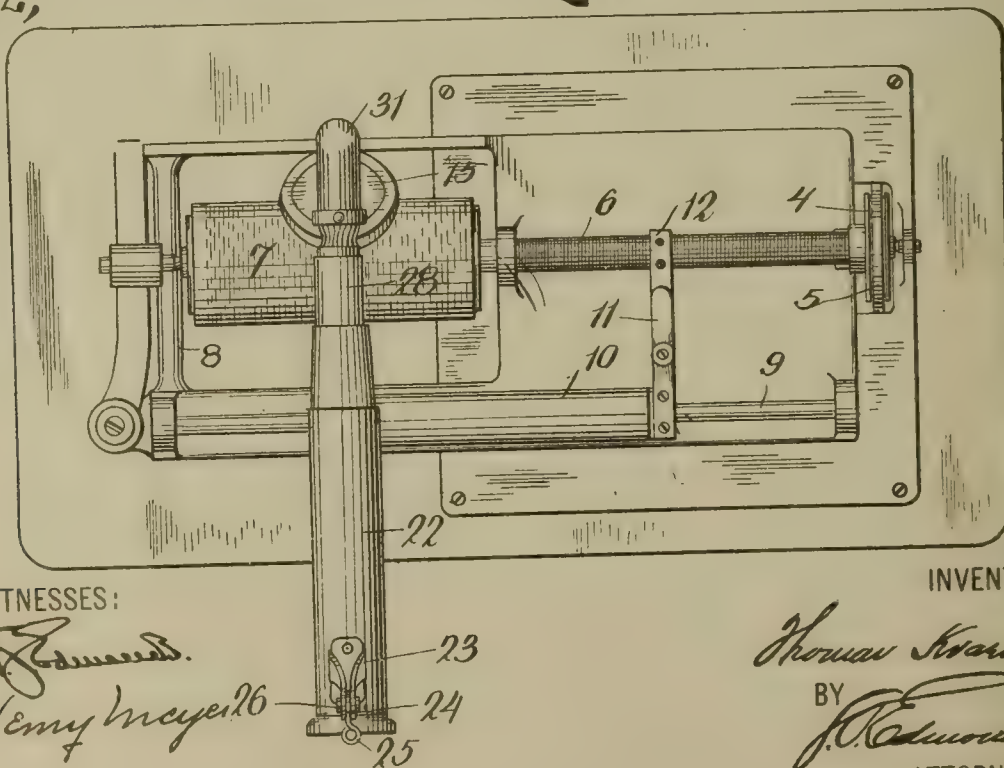


Fig. 2,



WITNESSES:

J. Edwards.

Henry Ince.

INVENTOR

Thomas Kraemer

BY

J. C. Edwards

ATTORNEY

UNITED STATES PATENT OFFICE.

THOMAS KRAEMER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HAWTHORNE & SHEBLE MANUFACTURING COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

TALKING-MACHINE.

960,560.

Specification of Letters Patent.

Patented June 7, 1910.

Application filed March 10, 1909. Serial No. 482,521.

To all whom it may concern:

Be it known that I, THOMAS KRAEMER, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

This invention relates to talking machines and particularly to machines of the type having a reproducer which is movable in a straight line over the sound-record and a sound-conveying member pivotally mounted at one end and connected to the reproducer at the other end thereof.

The object of the invention is to effect certain improvements in the construction of machines of this type, the improvements being directed particularly to simplifying the construction, to the provision of a passage for the sound-waves which is comparatively free from bends and to reducing the cost of manufacture without making any sacrifice in the strength of the parts of the machine or in the freedom of operation thereof.

The invention is of particular utility in a machine employing a sound-record of cylindrical form and a reproducer movable in a straight line parallel to the axis of this cylindrical record during the reproduction of the sound-record, as in phonographs of the type now commonly used. With such a movable reproducer is employed a tone-arm pivotally mounted at one end upon a supporting-arm projecting upwardly from the motor-box of the machine, this tone-arm communicating with an amplifying horn also mounted on this supporting-arm. At its free end this tone-arm is connected to the reproducer and this connection is effected in such a manner as to maintain the connection between the end of the tone-arm and the reproducer while the former is turning about a pivot and the latter moving in a straight line. For this purpose the end of the tone-arm is pivotally connected to a tubular extension on the reproducer and the tone-arm is made up of two or more sections which may move relatively so as to telescope more or less during the operation of reproducing a record and thus have its length increased or diminished as may be necessary, in order to maintain the desired connection

by allowing for the differences in the movements.

The preferred embodiment of my invention is illustrated in the accompanying drawings in which—

Figure 1 is a sectional elevation of a talking machine constructed in accordance with my invention and Fig. 2 is a plan view of a portion of the machine.

Referring to these drawings, the machine comprises a motor-box 1, having therein a motor for driving the support for the sound-record. The support is here shown as a mandrel 2, mounted upon a shaft 3, the end of which carries a pulley 4 on which a belt 5 runs to transmit rotary motion from the motor within the box to the shaft 3. The shaft 3 beyond the mandrel 2 is provided with a thread 6 corresponding in pitch to the thread of the record-groove upon the cylindrical sound-record 7, which is mounted upon the mandrel 2. The frame 8 of the machine supports a shaft 9 upon which is mounted the reproducer-carriage 10 and an arm 11 extending forwardly from this carriage has a half-nut 12 secured to its free end and coacting with the feed-screw 6 so that as shaft 3 is rotated the carriage 10 is caused to travel in the direction of the length of rod 9. The rod 9 forms a pivotal support for the carriage 10 and the forward end of the latter bears upon a horizontal surface on the upper edge of a wall 13 forming part of the frame 8. A lever 14 is pivotally mounted upon the forward end of the carriage 10 so that the forward end of the carriage may be raised a distance sufficient to carry the reproducer out of coaction with the sound-record. The reproducer 15 is mounted upon the carriage 10 and is provided with a pivotally mounted stylus 16 adapted to track in the record-groove formed in the sound-record 7 and to actuate the diaphragm of the sound-box 15.

Secured to the motor-box and extending upwardly therefrom is a supporting-arm for the amplifying horn and tone-arm of the machine. This arm may be constructed in any suitable manner, but the construction which I prefer to employ is that illustrated in Fig. 1 wherein the arm is shown as consisting of two parts 17 and 18, the former of which is secured to the motor-box 1 by

screws 19. The part 18 is provided with laterally extending ears at its lower end and screws 20 extend through openings in these ears and enter threaded openings in the upper end of the part 17. These parts may be readily detached for convenience in shipping and in making repairs. At its upper end the supporting-arm has an opening formed therein and a horn 21 is supported upon the upper end of the arm with the opening therethrough communicating with the opening formed in the arm.

The tone-arm 22 is pivotally mounted upon the supporting-arm with its end telescoping somewhat with the opening formed in the supporting-arm as shown in Fig. 1. Secured to the tone-arm is a yoke 23 having two upwardly extending arms which lie one on either side of a flange 24 extending outwardly from a sleeve 25 and a rivet 26 passing through these parts forms a pivotal connection between the flange 24 and arms 23. The sleeve 25 is adapted to receive a pin 27 extending upwardly from the supporting-arm so as to permit the tone-arm 22 to turn freely about a vertical axis. The tone-arm 22 may be of any suitable shape but at some point in its length it is provided with telescoping parts so as to permit an extension or contraction of the length of the tone-arm. Thus, I have shown the tone-arm provided with a section 28 at its free end, which is of smaller cross-section than the remainder of the tone-arm and within this is a sleeve 29 which is freely movable within the section 28 in the direction of the axis of these parts. The end of the section 29 projects beyond the end of the section 28 and this projecting end is provided with a spherical surface. This spherically-formed end of the section 29 is adapted to be received within an enlarged end 30 of a curved tubular member 31, the opposite end of which is adapted to receive a tubular extension 32 on the reproducer 15. This end of the tubular member 31 is split and provided with ears 33 which may be drawn together by a screw 34 in order to cause the member 31 to grip the extension 32. The parts 30 and 29 are held together by a pin 35 projecting through an opening in the enlarged end 30 and into an opening in the spherically-formed end of the section 29. With the parts thus constructed it will be seen that the reproducer 15 and the tubular member 31 move in a straight

line parallel to the axis of the sound-record during the sound-reproduction and that at the same time the tone-arm 22 and the section 29 move about a vertical axis, that is the axis of the pin 27. During these movements the spherically-formed end of the section 29 turns freely within the enlarged end 30 about the axis of the pin 35, and the section 29 moves axially within the section 28 and in accordance with the changes in the distance between the pins 35 and 27. The pin 35 fits within the openings in the parts connected thereby loosely enough to permit of the slight vertical movement of the reproducer effected by the lever 14 in moving the reproducer between operative and inoperative positions. The passageway for the sound-waves from the reproducer to the amplifying horn formed by the parts as above described, is comparatively free from bends so that a good reproduction and one which is free from foreign sounds may be obtained. Furthermore, this tone-arm construction consists of a small number of parts which may be manufactured and assembled at very low cost.

Having described my invention what I claim as new therein and desire to secure by Letters Patent of the United States, is as follows:

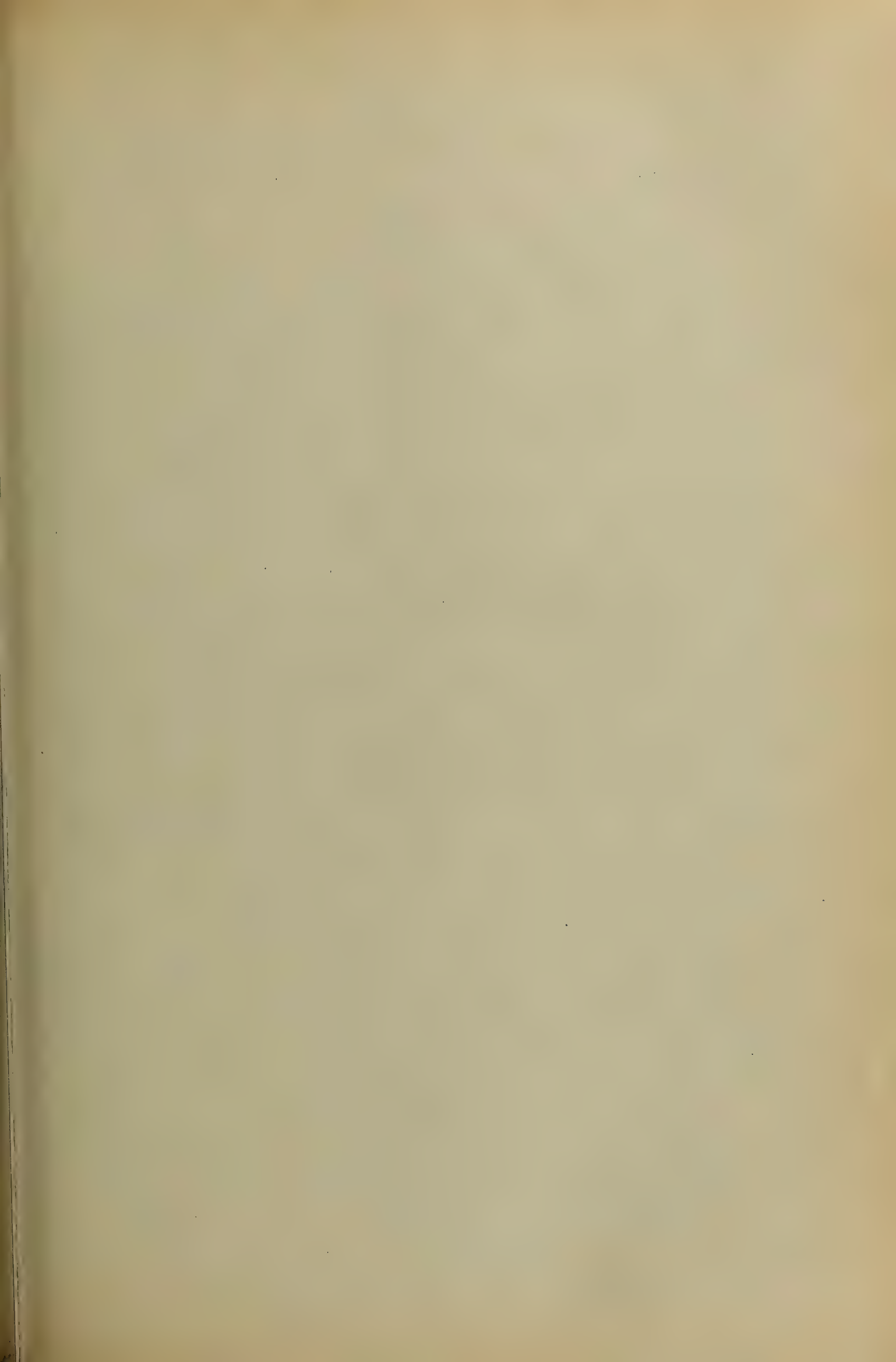
In a talking-machine, the combination of a motor-box, a support for a cylindrical sound-record thereon, means for rotating said support, a reproducer movable in a straight line over the sound-record on said support, a supporting arm extending upwardly from the motor-box, a tone-arm pivotally mounted upon said supporting-arm, a tubular section movable axially in the free end of said tone-arm and adapted to telescope more or less therewith, a tubular member having one end secured to the reproducer and curved intermediate its ends so that its opposite end is directed toward said supporting arm, and a pivotal connection between the last-named end of said tubular member and one end of said tubular section, substantially as set forth.

This specification signed and witnessed this 26th day of February, 1909.

THOMAS KRAEMER.

Witnesses:

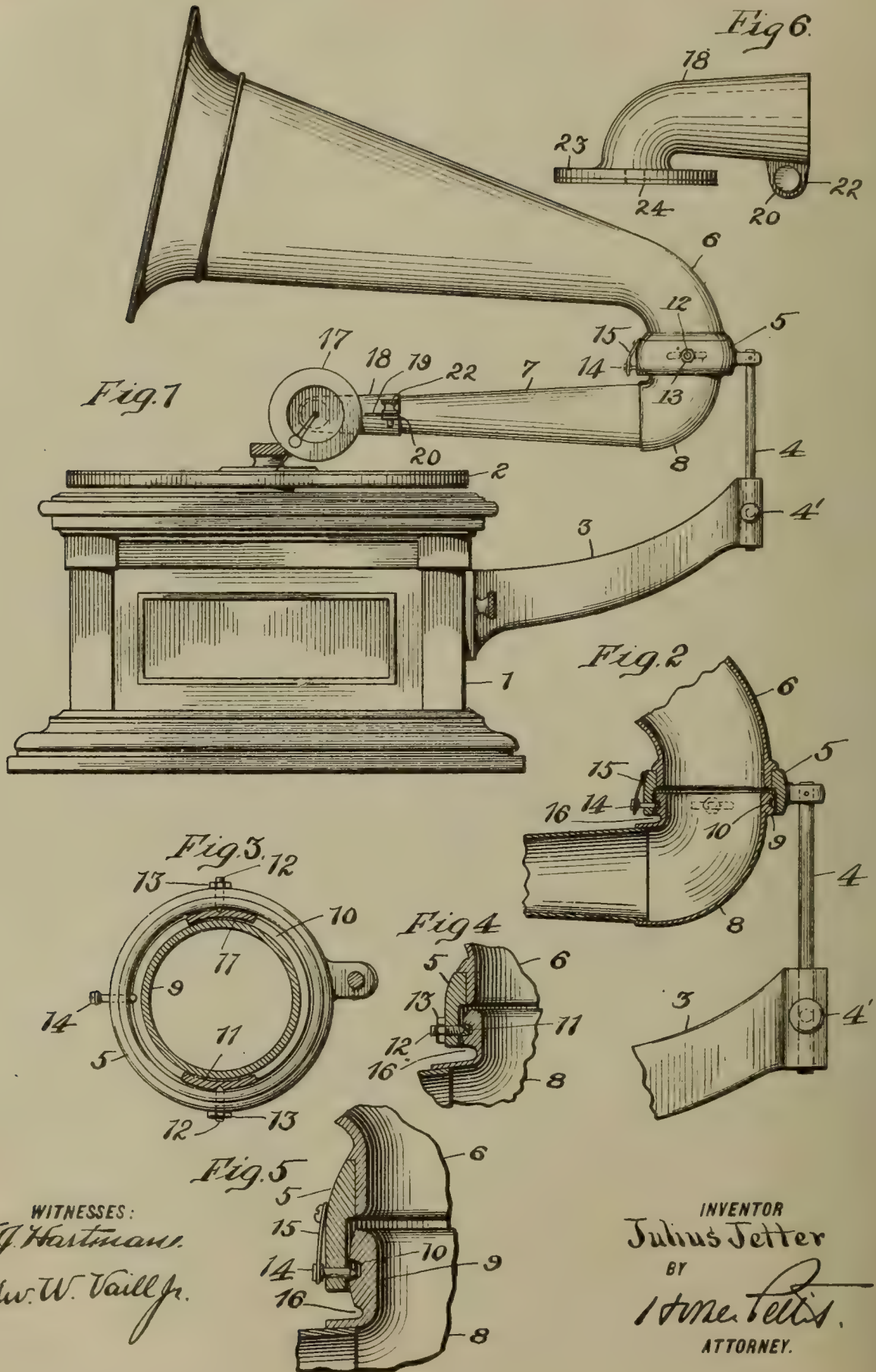
EMIL SCHUCH,
H. MÜHLSCHLEGEL.



J. JETTER.
TALKING MACHINE.
APPLICATION FILED APR. 28, 1904.

960,645.

Patented June 7, 1910.



WITNESSES:
F. J. Hartmann.
Edw. W. Vaill Jr.

INVENTOR
Julius Jetter
BY
Wm. L. Lott
ATTORNEY.

UNITED STATES PATENT OFFICE.

JULIUS JETTER, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, OF CAMDEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

TALKING-MACHINE.

960,645.

Specification of Letters Patent.

Patented June 7, 1910.

Application filed April 23, 1904. Serial No. 205,278.

To all whom it may concern:

Be it known that I, JULIUS JETTER, a citizen of the United States, and a resident of the city of Camden, State of New Jersey, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, clear, and complete disclosure.

The main objects of this invention are to provide, in a talking machine, an improved support for a tubular sound box arm, of simple and durable construction, which will be effective in action, and in which the interior of the arm is unobstructed by any projections, while at the same time the arm is supported so that it may be easily moved in the different directions required in the use of the machine; to provide improved means for retaining a sound box arm in its raised or inoperative position to permit of the insertion of a new needle or the removal of a record; to provide improved means for connecting a sound box to a sound conveying tube or other support; and to provide other improvements as will appear hereinafter.

In the accompanying drawings, Figure 1 is a side elevation of a talking machine constructed in accordance with this invention; and Figs. 2, 3, 4, 5 and 6 are fragmentary sectional views of details of the same.

Referring to the drawings, one embodiment of this invention comprises the usual motor casing 1 which carries suitable driving mechanism for actuating a vertical spindle carrying the usual turntable 2. Attached to the casing is an outwardly and upwardly extending bracket 3 provided adjacent its outer end with a vertical opening in which is mounted a vertical rod or support 4, which is adjustably retained in position within the opening by a thumb screw 4'. The upper end of this rod 4 carries fixed thereon a horizontal supporting ring 5 in the upper end of which telescopes the smaller end of an amplifying horn 6, and which has an enlarged opening in its lower portion adapted to receive the end of a tapering sound conveying tube or sound box arm 7, or an extension thereof.

The sound box arm 7 preferably terminates at its large end in an upwardly curved upwardly flaring elbow 8, attached thereto or integral therewith. This elbow of the sound box is provided at its upper end with an outwardly projecting annular flange 9,

provided externally with an annular peripheral groove 10 which preferably has inclined sides approaching each other at an angle of about 6°. The outer surface of the flange 9 is preferably spherical, and the flange fits loosely within the enlarged opening in the lower portion of the ring 5.

Within the annular groove 10 of the flange 9 of the sound box arm, slidably engage two segmental shoes 11 which conform in shape to the outer surface of the flange, and also to the tapering sides of the groove. These shoes 11 are provided externally midway of their ends with suitable sockets in which engage the inner ends of screw threaded pivots 12, which are threaded through the ring 5 at diametrically opposite points in a horizontal plane, the pivots being provided adjacent their outer ends and outside of the ring 5, with set nuts 13, which engage against the ring 5 and lock the pivots adjustably in position.

For holding the sound box arm 7 in an inoperative position, the ring 5 has an opening in the front side thereof which is substantially in the same horizontal plane with the pivot screws 12, and through which slidably passes a pin 14 engaged at its outer end by a leaf spring 15, attached to the ring 5 and adapted to force the pin inwardly toward the flange 9 of the sound box arm. At the lower side of the flange 9, on the elbow 8, a recess 16 is formed which extends for a considerable portion of the circumference of the elbow and parallel to the annular groove 10 thereof. The pin 14 is provided with a rounded or conical inner end, and when the sound box arm is in its operative position for reproducing sound, the pin engages loosely in the annular groove 10, but when the sound box arm is raised from the record and in its inoperative position, the pin 14 will be forced out of the groove 10 and will engage in the recess 16 below the groove, thereby retaining the sound box arm in its raised position.

For attaching a sound box 17 to the outer or free end of the sound box arm 7, an elbow 18 is provided, one end of which is split along one side by a kerf 19, and telescopes over the outer end of the arm, the elbow being provided with laterally extending ears 20 located upon opposite sides respectively of the kerf and engaged by a thumb screw or similar device 22 whereby

the elbow is clamped in position on the arm. The opposite end of this elbow 18 carries a vertical plate 23, upon one end of which is secured a piece of felt or similar elastic material 24, the sound box being placed over this piece of elastic material and connected with the plate 23. The sound box 17 may be of any well known or suitable construction.

It is evident from the above description, that in this construction, the sound box and its supporting arm are movable freely about a fixed horizontal axis, the arm being carried by the fixed pivots 12, and at the same time, the sound box and its arm are freely movable horizontally about the fixed vertical axis of the supporting ring, the elbow 8 of the arm being slidably rotated upon the shoes 11, the sound box and arm thus having a universal movement. When the sound box and its arm are moved either vertically or horizontally, the spherical flange 9 of the sound box arm will move easily within its supporting ring 5 and without binding therein. It is also evident that in this construction a continuous unobstructed passage is provided from the sound box to the amplifying horn so that the sound waves in passing therethrough, will not be deviated, modified or changed in any manner by pins, cross bars, or other parts, which, in some instances, have been used. The sound waves are, therefore, allowed to proceed from the sound box through the passage to the horn with a regular and uniform increase in wave front, all changes in the shape of the passage being gradual and the passage having no sharp corners or recesses. The connections forming the joint between the sound box arm and its support are, in this construction, made practically sound tight without causing any friction which would retard the free movement of these parts. The yielding resilient connection provided between the sound box and its tubular support also acts advantageously in the operation of the machine.

Having thus fully described this invention, I claim and desire to protect by Letters Patent of the United States:

1. In a talking machine, the combination with a sound conveying tube, of a support therefor comprising a shoe carried by said support and engaging said tube, said shoe being mounted to oscillate upon an axis fixed and transverse to said tube.

2. In a talking machine, the combination with a sound conveying tube, of a fixed support having an opening in which said tube telescopes, and shoes engaging said tube and carried by said support, said shoes being mounted to oscillate upon an axis fixed and extending diametrically of said opening.

3. In a talking machine, the combination with a sound conveying tube, of a fixed sup-

port having an opening in which said tube telescopes, oppositely disposed shoes slidably engaging said tube, and fixed pivots carried by said support and engaging said shoes, said tube being thus mounted upon a universal joint.

4. In a talking machine, the combination with a sound conveying tube having a flange at one end thereof, of a fixed support having an opening therein adapted to receive said flange, said flange being provided with a circumferential groove, shoes carried in said groove, and pivots carried by said support and engaging said shoes.

5. In a talking machine, the combination with a sound conveying tube having a spherical flange at one end thereof, said flange having a circumferential groove, of a fixed support having an opening therein adapted to receive said flange, pivots carried by said support, and shoes carried in said groove, and engaged by said pivots.

6. In a sound reproducing machine, the combination of a sound conveying tube, a support therefor, and an element interposed between said tube and said support, said element being mounted to oscillate upon an axis fixed and transverse to said support, and having sliding engagement with said tube.

7. In a sound reproducing machine, the combination of a sound conveying tube and a support therefor provided with an opening, the end of said tube being inserted in said opening and provided with a peripheral groove, shoes oppositely disposed in said groove, said shoes being mounted to oscillate about a fixed axis extending transversely of said opening.

8. In a sound reproducing machine, the combination of a sound conveying tube and a support therefor provided with an opening, the end of said tube being inserted in said opening and provided with a peripheral groove, shoes oppositely disposed in said groove, and a fixed pivotal connection between each of said shoes and said support.

9. In a sound reproducing machine, the combination with a sound conveying tube, of a fixed collar for supporting the same, and pivots passing through the walls of said collar to hold said tube in position, said tube being mounted to oscillate either vertically or horizontally.

10. In a sound reproducing machine, the combination of a sound conveying tube and a collar for supporting the same, oppositely arranged pivots passing through the walls of said collar and shoes journaled on said pivots, said tube being rotatably mounted on said shoes.

11. In a sound reproducing machine, the combination of a sound conveying tube and a support therefor comprising oppositely arranged fixed pivots suitably mounted and

shoes pivotally mounted on said pivots, said tube being rotatably supported on said shoes.

12. In a sound reproducing machine, the combination of a sound conveying tube having a peripheral groove in one end, a support, and elements slidably arranged in said groove and fixed means for pivotally mounting said elements on said support.

13. In a sound reproducing machine, the combination of a sound conveying tube, a support therefor, said tube being movable vertically on said support, and means fixed with respect to said support for holding said tube in a raised position.

14. In a sound reproducing machine, the combination of a sound conveying tube, a support therefor, said tube being movable vertically on said support, and a spring catch fixedly secured on said support for holding said tube in a raised position.

15. In a sound reproducing machine, the combination of a sound conveying tube, a support therefor, said tube being movable vertically on said support, a spring catch fixedly mounted on said support, and means on said tube for engaging with said catch to hold said tube in a raised position.

16. In a sound reproducing machine, the combination of a sound conveying tube, a support therefor, said tube being movable vertically on said support, and a spring catch mounted in said support, said tube being provided with a recess adapted to lock with said catch when said tube is in a raised position.

17. In a talking machine, the combination with a sound conveying tube, of a horizontal pivot for one end of said tube, said end being provided with recesses, and a spring pressed pin adapted to engage said recesses.

18. In a talking machine, the combination with a sound conveying tube, of a fixed support having an opening therein, horizontal pivots carried by said support and adapted to cooperate with the end of said tube to allow the same to turn on a horizontal axis, the end of said tube being provided with recesses, and a spring pressed pin also carried by said support and adapted to engage said recesses.

19. In a talking machine, the combination with a sound conveying tube having a flange at one end thereof, said flange having a circumferential groove therein, shoes carried by said groove, a fixed support having an opening within which said flange is adapted to fit, pivot pins or screws passing through said support and adapted to engage said shoes, and a spring pressed pin also carried by said support and adapted to engage said groove in said flange, and also adapted to engage a second recess in said tube.

20. In a talking machine, the combination with a sound conveying tube, of a support for the outer end of said tube permitting

universal movement of said tube about said support, and a spring pressed pin carried by said support and adapted to engage said tube when it is moved vertically upward, and to retain said tube in such upward position.

21. In a talking machine, the combination with a sound conveying tube, of a support for the outer end of said tube permitting universal movement of said tube about said support, a spring pressed pin carried by said support, and a recess within said tube adapted to receive and retain said pin when the sound conveying tube is moved vertically upward.

22. In a talking machine, the combination with a sound conveying tube, of a support for the outer end of said tube, permitting universal movement of said tube about said support, a spring pressed pin carried by said support and adapted to engage said tube when it is moved vertically upward, and means for retaining said tube in such upward position free to be rotated.

23. In a talking machine, the combination with a sound conveying tube, of a support for the outer end of said tube, permitting universal movement of said tube about said support, a spring pressed pin carried by said support and a recess within said tube adapted to receive and retain said pin when the sound conveying tube is moved vertically upward, thereby holding the said tube elevated and also adapted to retain said pin when the said tube is moved laterally while in such elevated position.

24. In a talking machine, the combination with a sound conveying tube, of a support for the outer end of said tube allowing universal movement of said tube about said support, and means for engaging the said outer end of said tube when the inner end of said tube is elevated to retain the said tube in an elevated position free to be rotated within its support.

25. In a sound reproducing machine, the combination with a sound conveying tube and a sound box carried thereby, of a support for said tube and means for adjusting said support vertically.

26. In a sound reproducing machine, the combination of a bracket, a collar adjustably supported on said bracket, and an amplifying horn supported in said collar.

27. In a sound reproducing machine, the combination of an arm carrying a sound box, a collar in which said arm is mounted, a supporting rod for said collar, and a bracket in which said rod is adjustably mounted.

28. In a sound reproducing machine, the combination of a sound conveying arm and a horn angularly connected together, a collar located at the joint between said arm and said horn, and means for adjusting said collar vertically.

29. In a sound reproducing machine, the combination with a sound conveying tube and a horn, of means for mounting the same consisting of a bracket, a collar embracing said tube and horn, and means for adjustably supporting said collar on said bracket.

30. In a sound reproducing machine, the combination with a sound conveying tube and a horn, of means for mounting the same, consisting of a bracket and means for adjustably supporting said tube and horn on said bracket.

31. In a talking machine the combination of an arm carrying a sound box, a bearing-head in which said arm is mounted, an eccentric supporting rod on said bearing-head and a bracket in which said rod is adjustably mounted.

32. A support for a sound reproducer comprising a vertically adjustable guide, a tubular arm forming a continuation of the reproducer and terminating within the guide, and supporting means interposed at diametrically opposite points between the arm and guide to serve as bearings upon which the arm is suspended free to swing vertically and horizontally.

33. In a sound reproducing machine, the combination of a sound conveying tube and a fixed collar for supporting the same, said tube being mounted in said collar to oscillate in all positions thereof upon the same two axes fixed with respect to said collar.

34. In a sound reproducing machine, the combination of a sound conveying tube, a fixed collar, and means between said collar and said tube and adjustable from the outside of said collar for holding said tube in position, said tube being mounted in said collar to oscillate in all positions thereof upon the same two axes fixed with respect to said collar.

35. In a sound reproducing machine, the combination of a sound conveying tube and fixed means for supporting the same, said tube being mounted to oscillate upon either of two axes fixed with respect to said means.

36. In a sound reproducing machine, the combination of a sound conveying tube, a fixed collar, and means between said collar and said tube and adjustable from the outside of said collar for holding said tube in position, said tube being mounted in said collar to oscillate in all positions thereof upon the same two axes.

37. In a sound reproducing machine, a mounting for a swinging reproducer arm comprising fixed pivots, the inner end of said arm being mounted to swing horizontally and vertically on said pivots.

38. In a sound reproducing machine, a mounting for a swinging reproducer arm comprising fixed pivots, the inner end of said arm being mounted to have universal movement upon said pivots.

39. In a sound reproducing machine, the combination of a sound-conveying tube and a fixed collar for supporting the same, and pivots passing through the walls of said collar and engaging said tube to hold the same in position, said tube being mounted to have universal movement on said pivots.

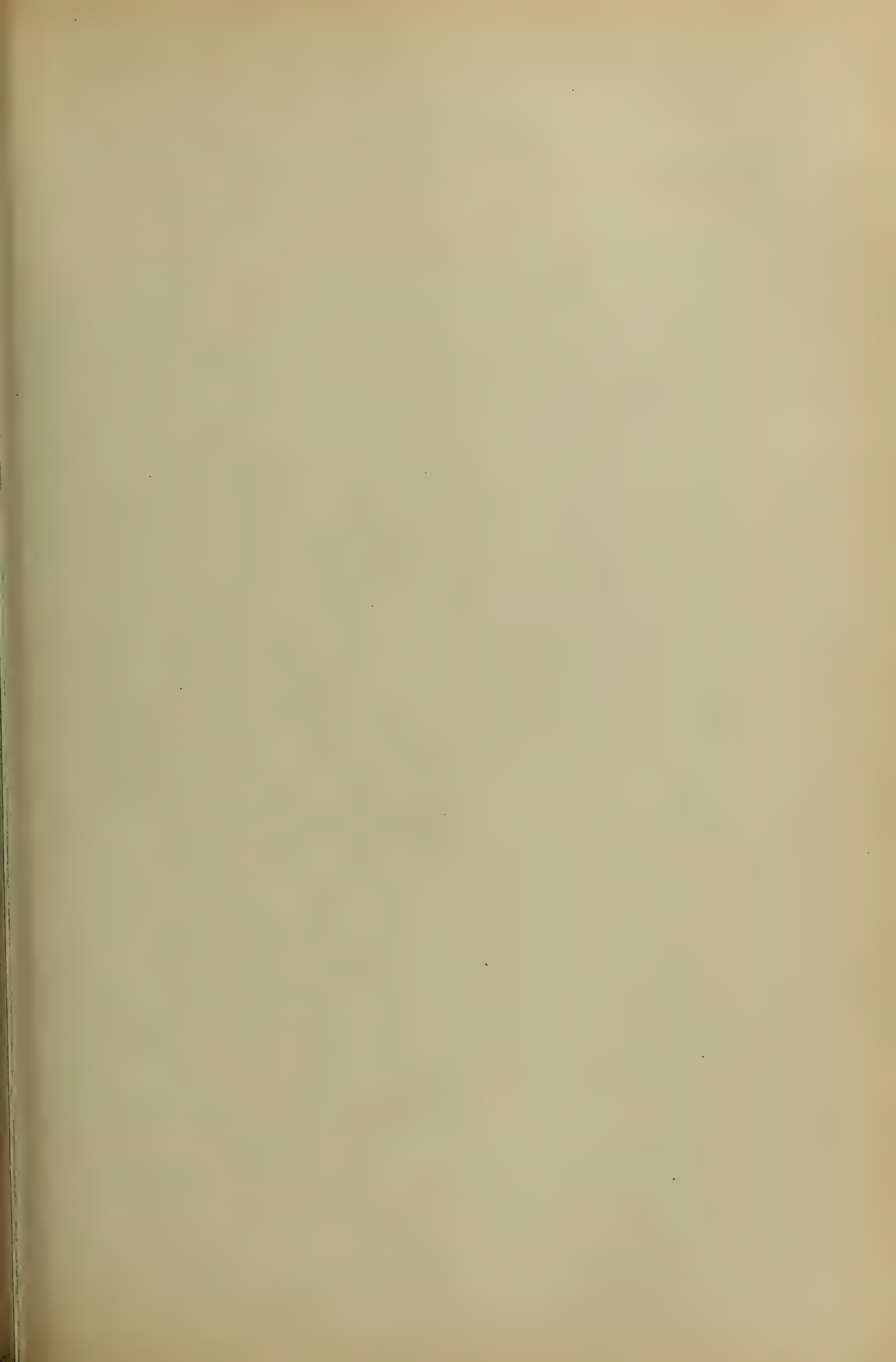
40. In a sound reproducing machine, the combination of a sound-conveying tube and a fixed collar for supporting the same, and oppositely arranged pivots passing through the walls of said collar, the inner end of said tube being mounted to have universal movement upon said pivots.

In witness whereof I have hereunto set my hand this 20th day of April, 1904.

JULIUS JETTER.

Witnesses:

LEWIS H. VAN DUSEN,
EDW. W. VAILL, Jr.



960,834.

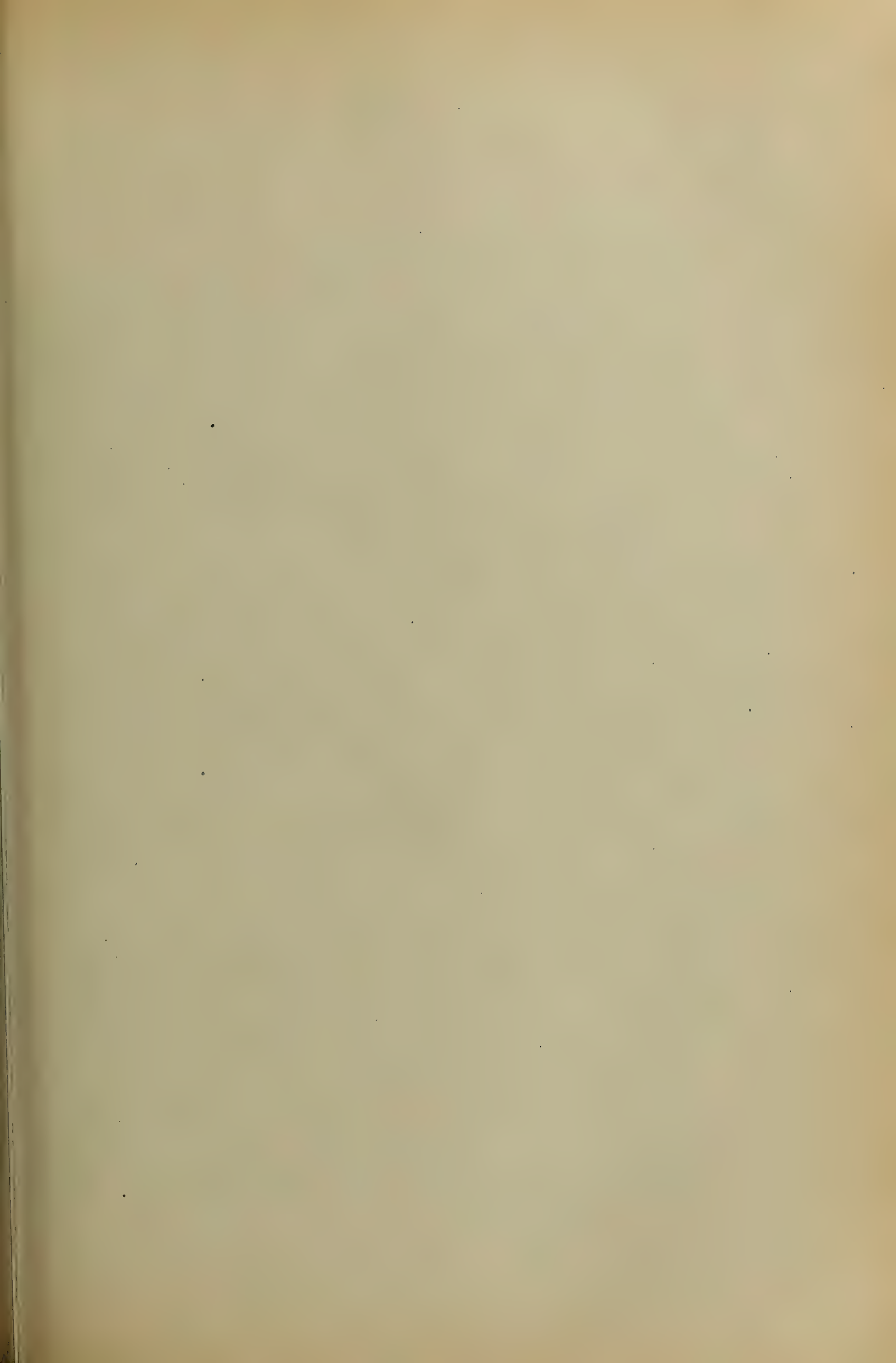
28 SHEETS—8 SHEET 1.



Jas. F. McLaughlin
Frederic B. Wright

E. G. Siggers

Attorney

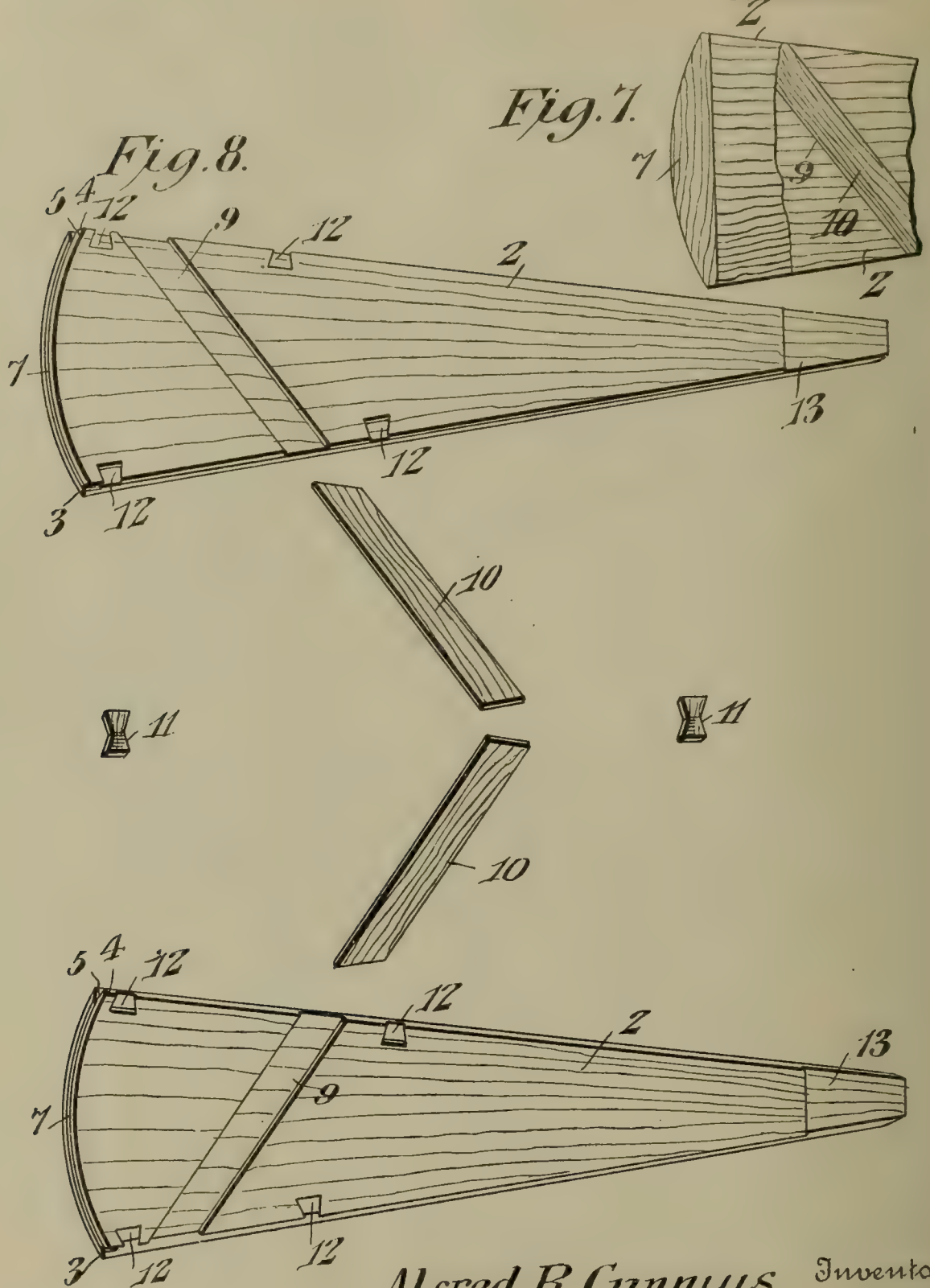


A. R. CUNNIUS.
HORN FOR SOUND REPRODUCING MACHINES.
APPLICATION FILED DEC. 4, 1908.

960,834.

Patented June 7, 1910.

2 SHEETS—SHEET 2.



Alfred R. Cunnius, Inventor

Witnesses
Jas. S. McLaughlin
J. W. Wright

By E. G. Siggers
Attorney

UNITED STATES PATENT OFFICE.

ALFRED R. CUNNIUS, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO LIPMAN KAISER, OF EAST ORANGE, NEW JERSEY.

HORN FOR SOUND-REPRODUCING MACHINES.

960,834.

Specification of Letters Patent.

Patented June 7, 1910.

Application filed December 4, 1908. Serial No. 465,998.

To all whom it may concern:

Be it known that I, ALFRED R. CUNNIUS, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented a new and useful Horn for Sound-Reproducing Machines, of which the following is a specification.

My invention relates to megaphones or horns used for sound-reproducing machines, and particularly to the construction of a wooden horn, the object of my invention being to provide a horn of this character which shall attain a high degree of purity of tone, and eliminate any harsh or metallic ring.

Particularly my object resides in forming a horn of this character which shall be cheap of manufacture, combined with strength and durability, and at the same time so construct the horn that the means used for strengthening shall add to the beauty of the article.

The invention consists in a horn made up of thin strips or sections interengaged at their edges, bound to each other by doubled dovetailed dowels, and by transverse strips or bars let into the sections and crossing the same, the ends of the sections being further prevented from splitting by inserts of wooden slips transverse in grain to the grain of the sections.

In the drawings, Figure 1 is a side view of a horn constructed in accordance with my invention; Fig. 2 is a fragmentary enlarged section of the longitudinal staves across the dovetailed dowel; Figs. 3, 4 and 5 are transverse sections showing different means of making a joint between two longitudinal staves; Fig. 6 is a lower end view of one of the longitudinal staves or sections to show the inlet slip which prevents splitting of the sections; Fig. 7 is a face view of the lower end of one of the staves or sections, the wood being partly broken away; Fig. 8 is a view showing two adjacent longitudinal strips, the transverse binders and the dowels therefor, disassembled.

My horn is made up of a series of staves, 2, or flat strips of wood, larger at one end than at the other. These staves are grooved on one of their edges and formed with a tongue on the other edge, as shown in Figs. 2 to 5, it being understood that the tongue on one edge of one of the staves will engage with the groove on the adjacent edge of the other stave, as shown in these figures. I do not wish to limit myself to the manner

in which I may form this groove and tongue joint, though I prefer the form shown in Fig. 3, wherein one edge of one stave is made with a wedge-shaped tongue and the adjacent edge of the other stave is made with a wedge-shaped groove into which the tongue 3 fits. It will be seen from Fig. 3 that the tongue 3 is not the entire thickness of the stave 2, but that a shoulder 4 is formed at one edge which abuts against a shoulder 5, formed on the adjacent stave 2. This makes an exceedingly strong construction.

In Fig. 4 the tongue is formed by simply cutting the edge of one stave 2 at an inclination to its surface, and then cutting a groove in one side of the adjacent stave and inserting this edge therein.

In Fig. 5 the joint is formed by grooving both of the adjacent edges of the staves and inserting a tongue, 6, into the grooves.

I do not wish, of course, to limit myself to any of the forms shown, as a suitable joint may be made in any other manner well known to wood-workers.

The flat strip or stave 2 is preferably next cut on its outer transverse edge with a slot running transverse to the grain and about one and one-half inches deep. This groove, which is located midway in the thickness of the stave, is now filled with an inlet or slip of wood, 7, of such length as to extend from one side edge of the stave to the other as shown in Fig. 6, the grain of which runs transverse to the grain of the stave as shown in Fig. 7. This inserted slip is glued in place and absolutely prevents the wood from splitting at this point, even under hard usage. Horns of wood are particularly liable to split at this point, and therefore require some binding means. At the other end of the horn the strips are bound together by a ferrule 8, and hence, require no insert. The next step in the operation is to cut a shallow groove 9 across the upper face of the stave transverse to the grain thereof, and preferably at an angle to the axial line of the stave, as shown in Fig. 8. I have found in practice that this groove should be about one-sixteenth of an inch deep. While I prefer to cut this groove on the outer face of the stave, as this tends to provide an ornamental finish to the horn, as shown in Fig. 1, I do not wish to limit myself to this, as the groove might be cut on the inside face

of the stave, or, indeed, both faces. A strip 10 of thin wood or veneer is now glued into position in the groove 9, either on the outside of the stave, on the inside or both sides, as before mentioned. Preferably as shown in Figs. 1 and 8, the groove 9 extends at an angle to the axial line of the staves and the grooves of two adjacent staves are inclined oppositely to each other so that when the strips 10 are in place, the strips will take the form of a star-shaped figure when viewed from the small end of the horn. This adds very materially to the ornamental nature of the horn and, at the same time, the strips 10 prevent the staves from splitting. The staves are now bent so that the horn will have the usual flared form as shown in Fig. 1, and after this has been done the strips are placed together and glued. After being permanently bent and glued together, small dowels or tie pieces, 11, are inserted into recesses 12 at the adjacent edges of each two staves. As will be seen from Figs. 1 and 8, these dowels are thinner than the thickness of the staves and having a double dovetailed form. It will be seen from Fig. 2 that the dowels 11 have their opposed portions bent at an angle to each other so as to conform to the angle of two adjacent staves. These dowels after being glued in place, prevent the joints from opening and add greatly to the strength of the joint and to the strength of the horn as a whole. I have shown two sets of these dowels, one near the outer scalloped edge of the horn and the other above the slips 10, but I do not wish to be limited to this as I may use more or less of these dowels, as desired. While I prefer to make these dowels flat with the staves, yet I may allow them to project above the staves by making them thicker than the recesses 12 which they fit. This construction does not change in any way the function of the dowels, but adds somewhat to the ornamental effect. The dowels coöperate with the tongue and grooves for preventing the joints from opening at the larger end of the horn, while the ferrule 8 prevents the joints from opening at the smaller or mouth end of the horn. The reinforcing strips 7 and a ferrule at the opposite ends of the staves prevent longitudinal splitting of the fibers at points between the joints of adjacent staves. The advantage of this arrangement is that relatively thin staves may be employed and yet an extremely strong and durable horn produced, all the tying and reinforcing parts except the ferrule 8, being made of wood so as not to impair the purity of the tone. The inner end of the strips is reduced as at 13 to accommodate the ferrule 8. This protects the wood at the small end of the horn and also serves as the connecting means by which the horn is fastened to the elbow

of the usual sound-reproducing machine, or to a reducer which is used where the horn is to be applied to a cylinder-type of talking machine.

It will be seen that the construction above described, provides a horn which, being made of wood, has no metallic sound, which softens and sweetens the tone of the reproducing instrument, and which is, at the same time, extremely strong and bound together so rigidly as to form a horn practically of one piece of wood. Horns constructed in accordance with my above description, are capable of standing great strain, while they are very much cheaper to construct than the horns now on the market.

Because of the transverse slips 7 and 10 the individual staves will not split under changes in temperature, or in service, and because of the dowels 11 the joints between the staves will not open, nor will the staves split as they might do under strain if no dowels were used. Since each stave is considerably wider at its outer end than at its inner end, the grain becomes shorter and shorter along the side edges from the narrower to the wider end so that at the wider end the grain is comparatively short, and hence the reinforcing strips 7 and 10 are provided at this point where the liability of splitting is greatest. Along the axis of each stave, the grain extends the full length so that it is unnecessary to reinforce the stave at the narrower end. Each stave is of greatest length along the longitudinal axis, since the outer end of the horn is scalloped and the inset reinforcing pieces 7 are disposed in the scallops to strengthen the staves at this point where they are liable to strike should the horn drop on the floor.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be readily apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportions and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having thus described my invention, what I claim as new and desire to secure by Letters-Patent, is:

1. A horn for sound-reproducing machines composed of a series of edge contacting staves, the plane of the said staves being at an angle to each other and the adjacent edges of the staves provided with registering recesses open in corresponding faces of the staves and of less depth than the thickness of the latter, and wooden dowels inserted in registering recesses with their grain extending transversely to the joint between the staves, each dowel consisting of two portions

disposed at an angle to each other conforming to the angle between the surfaces of two adjacent staves.

2. A horn section comprising a wooden 5
stave tapering in one direction, and a wooden reinforcing strip fastened to the stave and extending transversely to the axis of the stave from one edge to the other, said stave being longitudinally bent into a gradual 10
curve after the said strip is secured thereto whereby the strip conforms to the curvature of the stave.

3. A horn section comprising a wooden 15
stave of tapering form having a transverse groove in one surface extending from one longitudinal edge to the other and having a slot in its wider end edge extending from one longitudinal edge to the other, wooden stiff-
ening strips set into the groove and slot 20
and each forming a continuous piece extending from one edge of the stave to the other, said stave being longitudinally bent on a gradual curve after the securing of the strips in place.

4. A horn for sound reproducing machines composed of a series of edge-contacting staves, the plane of said staves being at an angle to each other, the adjacent edges of the staves being provided with registering 30
recesses open in corresponding faces of the staves and of less depth than the thickness of the latter, and wooden dowels inserted in said recesses with their grain extending transversely to the joints between the staves, said dowels being double dovetailed in plan, the two portions of the dowels being at an angle to each other conforming to the angle 35
between the surfaces of two adjacent staves.

5. A horn for sound reproducing machines composed of a series of edge-contacting staves, each stave being wider at one end than at the other and having attached thereto a transverse bracing strip, the transverse strip of one stave being at an angle to the 40
transverse strip of the adjacent stave, but the end of one strip registering with the adjacent end of the next successive strip.

6. A horn for sound reproducing machines composed of a series of edge-contacting curved staves of wood, the grain thereof running longitudinally of the staves, each stave being tapered in one direction and having a transverse recess formed in the face thereof, and having a transverse strip 50
of wood embedded in the recess and curved with the stave, the grain thereof running transversely to the grain of the staves, the transverse strip of one stave being at an angle to the transverse strip of the adjacent 55
stave, but registering with the end of the successive strip of the adjacent stave.

7. A horn for sound reproducing machines composed of a series of edge-contacting staves, each stave being wider at one end 60
than the other, and the series of staves be-

ing outwardly flared, the edges of adjacent staves being formed with a tongue and groove joint and with dowel recesses at intervals along each joint, and nonmetallic dovetailed dowels inserted in said recesses 70
across the joint and binding adjacent staves to each other, said dowels serving to hold the tongues of the joints seated in the grooves thereof.

8. A horn for sound reproducing machines composed of a series of edge-contacting wooden tapering staves of greater length along the longitudinal center line than the side edges, whereby the middle portions of the wider ends of the staves project beyond 80
the corners thereof, the grain being parallel to the longer axis of the staves, said staves being outwardly bent and having a tongue and groove joint on their adjacent edges, the edge at the wider end of each stave being 85
transversely slotted and having a slip of wood inserted and glued in said slot the grain whereof is transverse to the grain of the stave, the adjacent edges of each two staves being formed at intervals with dove- 90
tailed dowel recesses, and double dovetailed dowels inserted in said recesses and binding the adjacent staves to each other.

9. A horn section comprising a wooden stave of tapering form bent longitudinally 95
and having a tongue and a groove at opposite longitudinal edges, a superficial groove extending from one longitudinal edge to the other and at an angle to the longitudinal axis of the stave, and a longitudinally 100
curved stiffening strip of wood set into the said superficial groove with the ends of the strip flush with the longitudinal edges of the stave, said strip being bent with the stave and having its outer surface flush with 105
the outer surface of the latter.

10. A horn section comprising a wooden stave of tapering form and having a tongue and a groove at opposite longitudinal edges, a superficial groove extending from one 110
longitudinal edge to the other, and a stiffening strip of wood set into the said superficial groove with the ends of the strip flush with the longitudinal edges of the stave, said stave having sets of dowel-receiving 115
recesses at opposite sides of the superficial groove and extending from the longitudinal edges of the stave.

11. A horn section comprising a wooden stave of tapering form and having a tongue 120
and a groove at opposite longitudinal edges, a superficial groove extending from one longitudinal edge to the other, a stiffening strip of wood set into the said superficial groove with the ends of the strip flush with 125
the longitudinal edges of the stave, said stave having sets of dowel-receiving recesses at opposite sides of the superficial groove and extending from the longitudinal edges of the stave, a wooden stiffening strip set 130

into the larger end of the stave and arranged with its grain transversely to the grain of the latter.

12. A horn section comprising a wooden stave tapering in the direction of the grain thereof and having an arcuate edge at the larger end, said edge being centrally slotted in a plane longitudinally of the stave and extending the full width of the larger end of the same, and a reinforcing strip of wood set into the slot of the said edge with the grain transverse to the grain of the stave and having the outer edge curved to conform to the edge of the stave.

13. A horn section comprising a wooden stave tapering in the direction of the grain thereof and having an arcuate edge at the larger end, said edge being centrally slotted in a plane longitudinally of the stave and extending the full width of the larger end of the same, a reinforcing strip of wood set into the slot of the said edge with the grain transverse to the grain of the stave and having the outer edge curved to conform to the edge of the stave, one side of the stave having a superficial transverse groove extending from one of the longitudinal edges thereof to the other and disposed transversely to the grain of the stave, and a stiffening wooden piece set into the groove and having its outer surface flush with the outer surface of the stave, said strips serving to reinforce the stave at its larger end and prevent cracking or warping thereof.

14. A non-metallic horn comprising wooden staves tapering longitudinally and bent to form a curved flaring body, the said body being formed with a scalloped edge, each scallop being as wide as the wider end of each stave, each stave having its scalloped edge slotted longitudinally from one side to the other, and wooden reinforcing strips set into the slots of the staves and having their outer edges flush with the scalloped ends of the latter.

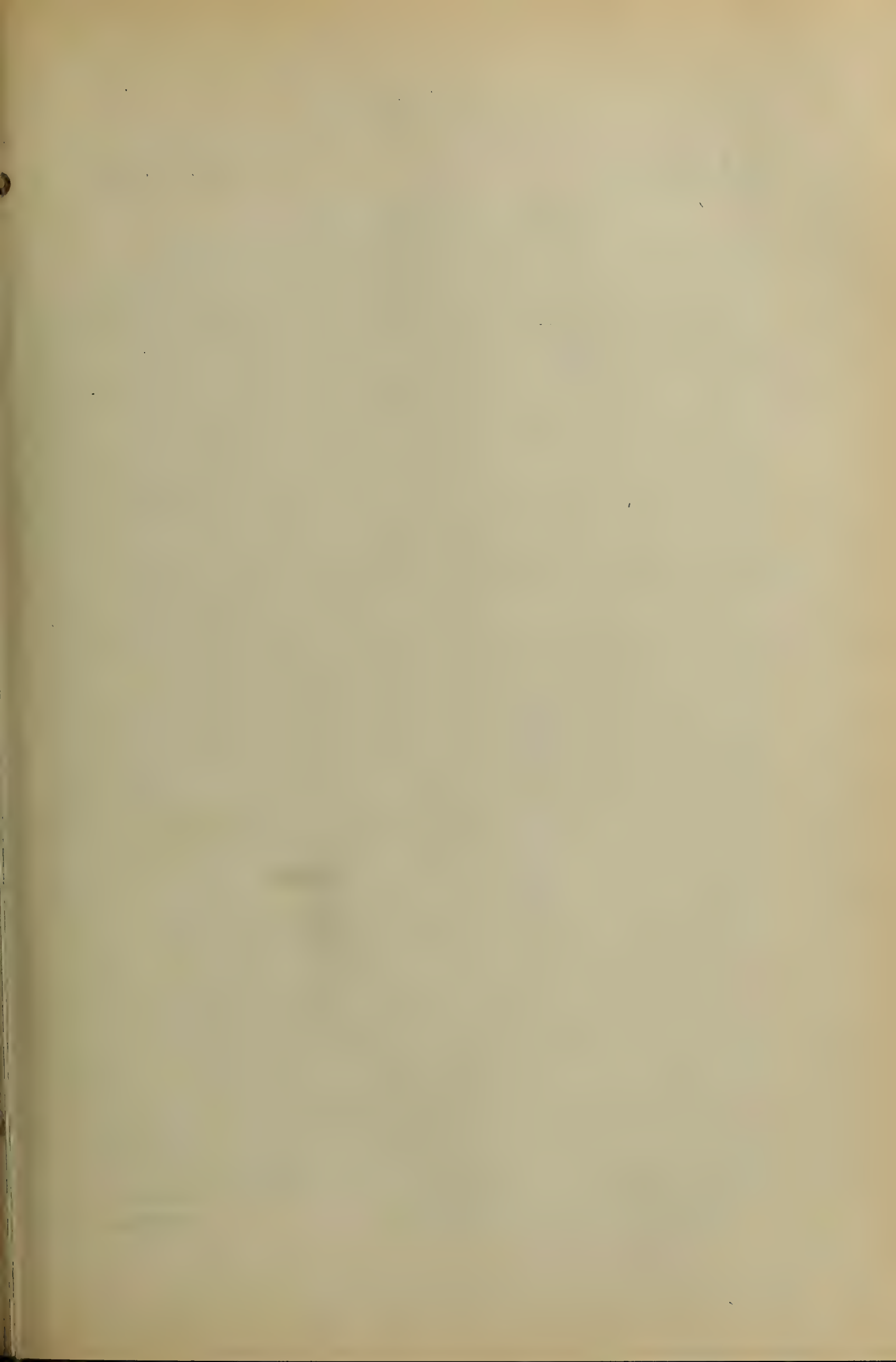
15. A non-metallic horn comprising a plurality of staves arranged edge to edge and each tapering longitudinally and curved outwardly to form a flaring body, wooden reinforcing strips in each stave, one of the strips being set into the edge of the stave, and the other set into the face of the stave, and both strips extending with their grain transverse to the grain of the stave, a set of tie pieces connecting adjacent staves together at points between both mentioned reinforcing strips, and a second set of tie pieces connecting the staves together at points inwardly from the last-mentioned reinforcing strips.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

ALFRED R. CUNNIUS.

Witnesses:

CLARENCE T. BENNINGER,
HENRY G. PONS.



W. F. MESSER.
 PHONOGRAM REPRODUCING APPARATUS.
 APPLICATION FILED AUG. 13, 1909.

961,980.

Patented June 21, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

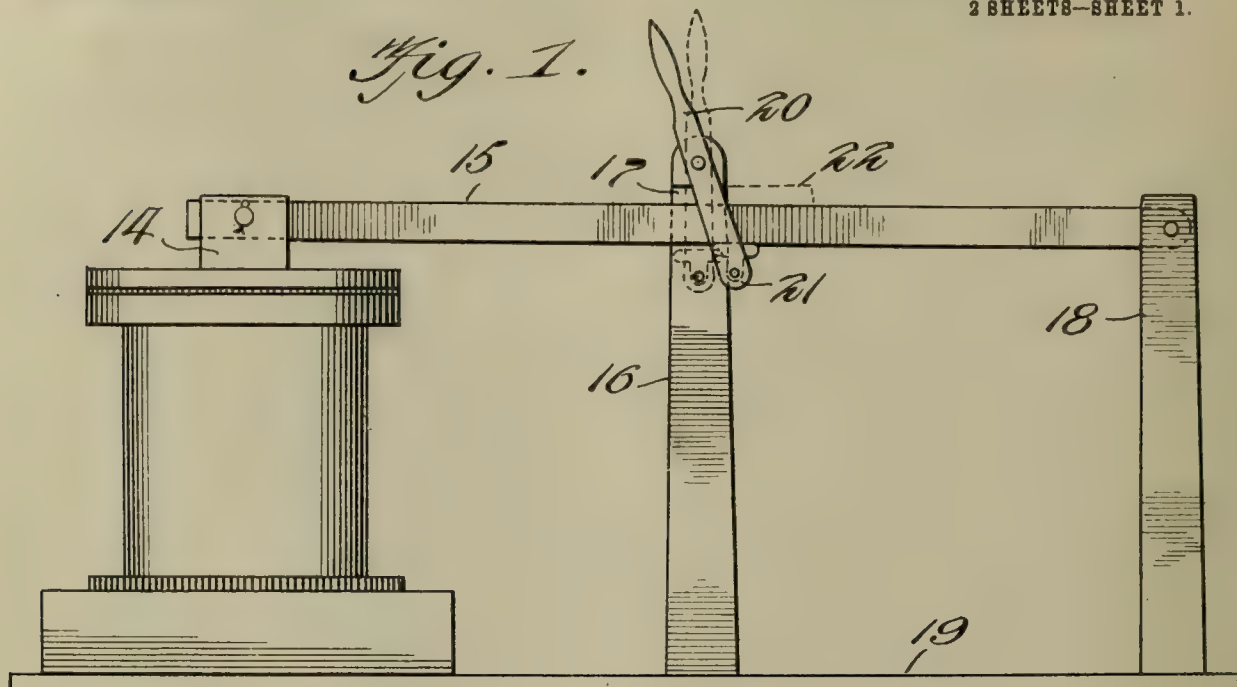
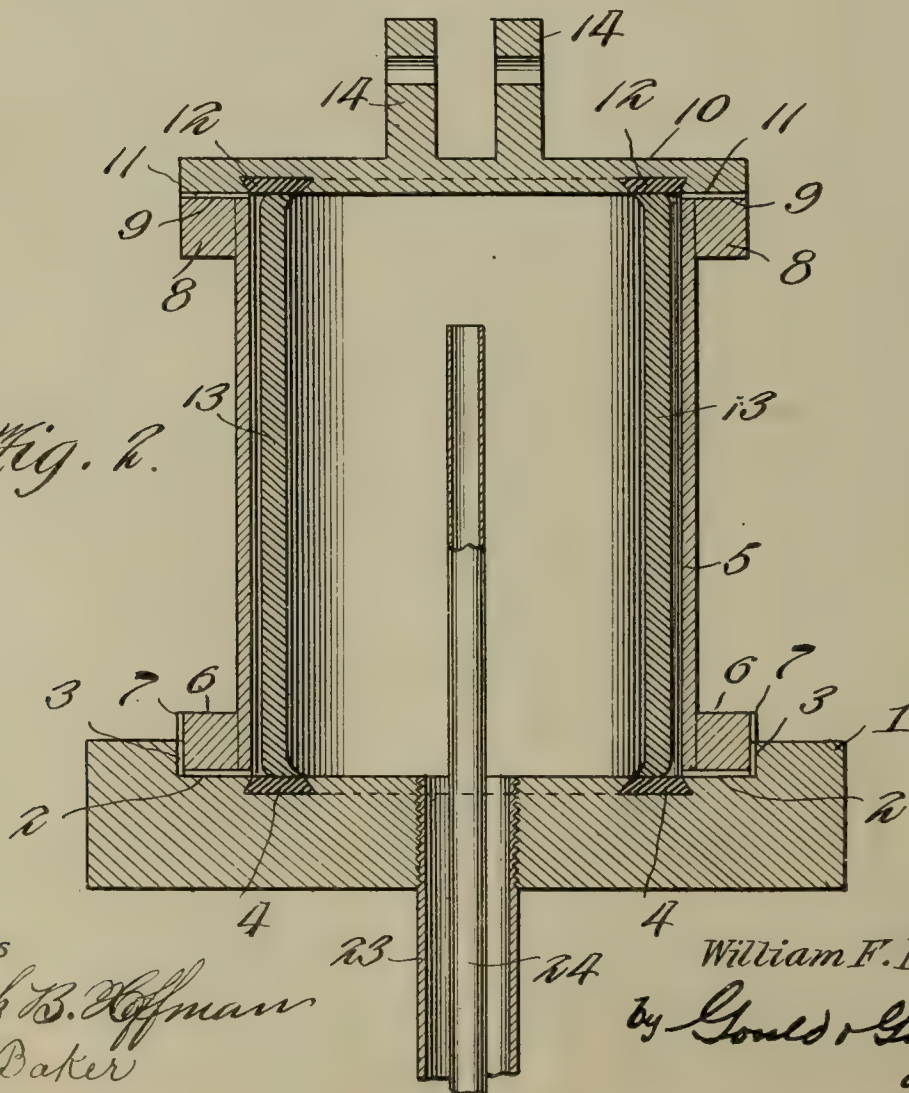


Fig. 2.



Witnesses

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W. F. MESSER.
PHONOGRAM REPRODUCING APPARATUS.
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Patented June 21, 1910.

2 SHEETS—SHEET 2.

Fig. 3.

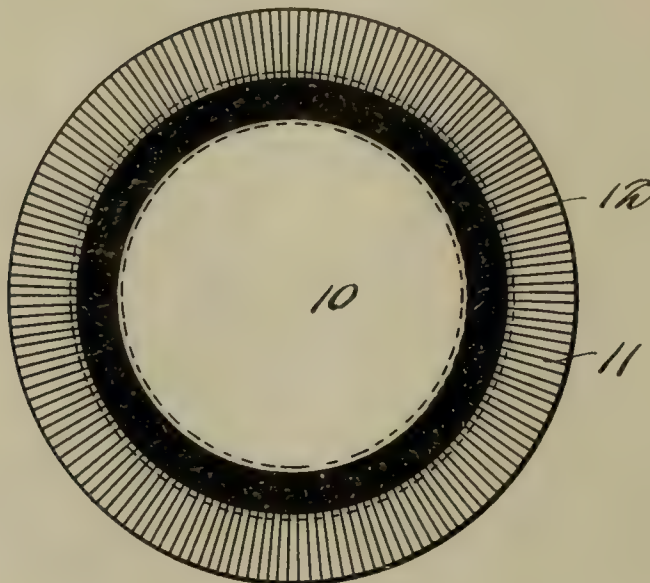
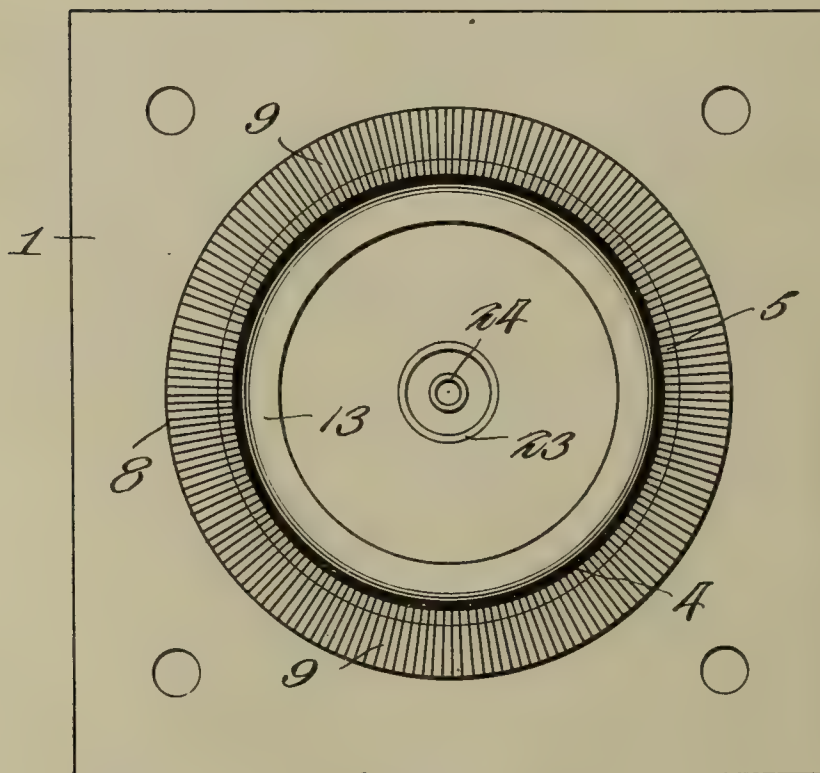


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM F. MESSER, OF CHICAGO, ILLINOIS.

PHONOGRAM-REPRODUCING APPARATUS.

961,980.

Specification of Letters Patent. Patented June 21, 1910.

Application filed August 13, 1909. Serial No. 512,718.

To all whom it may concern:

Be it known that I, WILLIAM F. MESSER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Phonogram-Reproducing Apparatus, of which the following is a specification.

This invention relates broadly to an improvement in apparatus for the production of phonograms being directed more particularly to such an apparatus designed to produce that form of record known as a cylinder record in the process of manufacture of which the plastic record material is molded under the influence of the expansive force of a fluid molding agent, such as steam under pressure, or the like.

The salient features of the invention reside in a resilient, removable seal disposed in such manner as to hermetically close the molding chamber into which the expanding mold fluid is introduced and in corrugated contacting portions of the base block, head plate, and matrix whereby air escapes communicating with the space between the matrix and the blank phonogram are provided.

It is well known in the art to which the invention relates that a large proportion of cylinder phonograms as at present produced are not true reproductions of the master record due in large part to two commonly-experienced causes, namely, the escape during the process of forcing the phonogram blank in contact with the matrix from some part of the molding chamber of a portion of the fluid molding agent which results in an unequal application of expansive force of said agent at different points on the plastic blank and incidentally producing too deep or too shallow an impression of the indentations of the matrix on the blank which, as obvious, causes a false tone value at that particular point when the record is being used, or the imperfect or distorted phonogram is the result of a partial retention at some point of a portion of the air between the matrix and the phonogram blank during the molding operation and preventing a proper contact between them.

One object of the present invention is the

provision of an apparatus such as above indicated in which the liability of accidental escape of the expanding molding agent from the molding chamber except at a desired time and through the proper channel is eliminated.

Another object is to provide a means whereby the air confined between the matrix and phonogram blank may be, during the process of contacting said blank and matrix, permitted to easily and completely escape from between said parts at an approximately uniform rate of flow, thus insuring, in conjunction with a perfectly-sealed molding chamber, a desired contact of the blank and matrix and overcoming the above-mentioned disadvantage of an impeded escape or partial retention of said air.

Another object is to provide a phonogram apparatus in which a movable headpiece while being automatically seated to operative position will simultaneously seal the ends of the molding chamber and be adapted to be locked in said position while the phonogram is being molded.

With these to be considered as the main objects the improvement will be described in the following specification taken in connection with the drawings accompanying the same and forming part of this application, and then more specifically pointed out in the appended claims.

In the drawings, Figure 1 is a side elevation of my invention, the head plate being illustrated as partially seated in operative position on the matrix. Fig. 2 is a central, vertical section of the base block, head plate, matrix, phonogram blank, and fluid inlet pipes, all shown in operative situation. Fig. 3 is a bottom plan of the head plate, showing one member of the sealing means, and Fig. 4 is a top plan of the apparatus with the head plate removed.

Referring now to the drawings, wherein is illustrated the preferred details of my invention and wherein like reference characters indicate like parts throughout the several figures, 1 denotes a base block of the molding apparatus formed of any desired conformation as to plan outline and of suitable rigidity and stableness to withstand the

usual pressure incident to the operation of apparatus of this class. The base block 1 is formed with an approximately circular, centrally-disposed depression 2 in which the matrix and cooperating parts of the apparatus are designed to seat and be effectually held against lateral movement thereof, the circumferential wall of said depression being provided with a corrugated or knurled surface 3, the ribs forming said corrugated surface being of slight lateral dimension and closely spaced one from another.

4 denotes a resilient, annular sealing member, such as rubber or the like, formed, as illustrated, with beveled edges to eliminate possibility of accidental displacement and disposed within a suitably-formed groove provided in the depression 2 and spaced from the edges thereof an appropriate distance to contact said sealing member with the lower end of the phonogram blank during the molding process, as later explained. As obvious the member 4 can be easily removed from its retaining depression if occasion arises such as when substitution is desired on account of wear or the like.

5 denotes a matrix, of usual cylindrical form employed in molding phonograms of this class and having of course impressed upon its inner face a negative of the indentations recorded upon the master record. An annular reinforcing member 6, formed of any suitable material, such as brass or the like, is shrunk upon the lower end of the matrix 5, the lower face of said ring lying approximately in a plane coincident with that of the lower edge of the matrix, as shown. The circumferential face and the bottom face of ring 6 are formed with a corrugated surface 7 the ribs of the former extending practically in a vertical direction, said ring being of such lateral extent as to provide for said ribs contacting with the corrugated surface 3 of depression 2, the ribs on the corrugated bottom face of said ring being disposed radially thereon throughout its entire length, and contacting with that portion of said depression underlying said face, the above-described arrangement providing a plurality of air channels of very small caliber communicating with the space which exists between the matrix and the phonogram blank previous to the forcing of the latter into contact with the former.

8 indicates an upper annular reinforcing member attached to the upper end of the matrix 5 in similar manner and relative position as ring 6 to the lower end of said matrix, and provided with a corrugated face 9, the ribs thereof being arranged in radial form. A removable head plate 10, co-exten-

sive in circular dimension with ring 8 is provided on that portion of its lower face which normally overlies the ring 8 and upper edge of the matrix 5 with a corrugated or knurled face 11 formed of ribs disposed in radial form similar to those of face 9 with which face 11 is designed to so contact when the head plate is seated in operative position on the matrix as to provide a series of air channels communicating with the space between the matrix and blank in similar manner and with like function as the channels formed between the base block and the ring 6, the construction just described in conjunction with that of said base block and corrugated contacting ring 6 providing unobstructed passage for the escape of air from said space at practically all points at the top and bottom of the matrix, the air being of course, as obvious, forced from said space into these channels at a practically uniform rate of flow as the phonogram blank approaches and is forced into contact with the inner record face of the matrix under the influence of the expansive force of the molding agent, all of said air being thus forced from said space into the channels and thence into the surrounding atmosphere immediately prior to the contact of the expanding blank and the matrix. An upper sealing member 12 by preference similar in form and material to the lower member 4 is removably disposed in the head plate 10 in a suitable annular groove in approximately vertical alinement with said lower sealing member, against the proximate faces of which sealing members the inwardly-turned flanges of the ends of the phonogram blank 13 are designed to contact when said blank is in operative position in the molding chamber, as illustrated clearly in Fig. 2 of the drawings, it being understood that these sealing members are of such consistency and the cooperating parts are so proportioned that when the head plate is seated in operative position and locked therein and under pressure of the molding agent that said flanges will be forced into the sealing members and effectually seal the molding chamber.

14 denotes a pair of upwardly-extending lug plates formed if desired integral with head plate 10 and to which is pivotally and removably attached one end of a seating-bar 15 disposed in loose contact with standard 16 formed with offset 17, and pivotally connected at its opposite end with standard 18, both of said standards and also the base block 1 being suitably attached as desired to a supporting platform 19. Connected to offset 17 and adapted for pivotal movement in relation thereto is a lifting lever 20 between which and the standard 16 the seating bar 15

passes, to the lower end of which lever a dog 21 is pivotally swung, the lever, dog, and the cooperating parts of the seating-bar being of such relative dimensions and position 5 that in the forward movement of the lever as shown in full lines in the drawings, the dog 21 will contact with the lower edge of the seating-bar 15 and raise it and the connected head plate out of contact with the 10 matrix and phonogram blank. A reverse movement of the lever, as shown in dotted lines in Fig. 1 will force the dog out of contact with said lower edge and permit the head plate to drop into operative position 15 and contact the upper sealing member with the phonogram blank, said blank having been previously seated of course in contact with the lower sealing member. A key 22 is adapted to be forced manually between the 20 offset 17 and the upper edge of the seating-bar and rigidly hold said bar and attached head plate in locked operation position.

An inlet pipe is denoted by 23, said pipe being connected to any desired source of 25 molding fluid under pressure, such as steam, said pipe being of course provided with appropriate inlet and cutout valves.

24 indicates an inlet pipe designed to convey a volume of cooling medium under pressure, said cooling agent, such as chilled air 30 or the like being introduced, as well understood in the art, subsequent to the contacting of the phonogram blank and the matrix for the purpose of setting the former to a sufficiently rigid consistency appropriate to its 35 safe removal from the molding chamber.

The blank, formed of any usually desired material, such as celluloid, having been placed in the molding chamber with its 40 lower flange in contact with the lower sealing member, the head plate is swung into position and seated by operation of the lever 20, when key 22 is employed to lock the same in place, the upper sealing member contacting 45 when said head plate is seated with the upper flange of the blank, as obvious, said blank lying at this period of the process in slightly spaced relation to the positioned matrix. Steam or other molding fluid is 50 then introduced through pipe 23 and the blank, initially introduced into the molding chamber in an appropriate state of plasticity, forced against the matrix under pressure of the molding fluid, the upper and 55 lower seals rendering the molding chamber perfectly steam tight, as desired, while the air confined between the blank and the matrix previous to the introduction of the steam or other molding fluid is forced out 60 from between said parts into the channels formed by the contacting corrugated faces of the matrix rings and the base block and

head plate and thence into the atmosphere, as before described. At the proper moment the steam is cut off and the cooling medium 65 under pressure admitted which sets the phonogram to a proper degree of hardness to enable it to be removed from the molding chamber.

I claim—

1. A phonogram reproducing apparatus, including sealing strips disposed directly above and below the upper and lower edges respectively of the phonogram cylinder. 70

2. A phonogram reproducing apparatus, 75 including a matrix, means for supporting the matrix, and a sealing strip underlying and bearing directly on the lower edge of the cylinder.

3. A phonogram reproducing apparatus 80 including a base block, a head plate, and a sealing strip inclosed by each of said parts to engage and bear directly on the ends of the record cylinder.

4. A phonogram reproducing apparatus 85 including a base block, a head plate, a matrix supported in the block and engaged by the head plate, the contacting surfaces of the matrix and head plate being formed to provide a series of divergent air escapes 90 disposed in the same horizontal plane.

5. A phonogram reproducing apparatus including a matrix, a record cylinder, a base block, a head plate, said base block and head plate being formed with a plurality of 95 radially-disposed channels to permit escape of air from between the matrix and cylinder.

6. A phonogram reproducing apparatus including a base block, a head plate, and a removable sealing member embedded in each 100 of said parts to engage and surround the uppermost and lowermost parts of the record cylinder.

7. A phonogram reproducing apparatus including a base block, a head plate, a matrix 105 supported in the block and engaged by the head plate, the contacting surfaces of the matrix and head plate being corrugated to provide air escapes.

8. A phonogram reproducing apparatus 110 including a base block, a head plate, a matrix supported in the block and engaged by the head plate, the contacting surfaces of the matrix and the head plate being formed with radially-disposed corrugations to provide 115 air escapes.

9. A phonogram reproducing apparatus including a matrix, a base plate for supporting the matrix, a head plate contacting with the matrix, the surfaces of the matrix 120 contacting with the head plate and with the base block being corrugated to form air escapes.

10. A phonogram reproducing apparatus

including a matrix, a phonogram blank, and a series of radially-disposed channels to permit escape of air from between said matrix and blank.

5 11. A phonogram reproducing apparatus including a phonogram blank, a base plate, a head plate, and sealing members removably embedded in said plates beyond the terminals of said blank and bearing directly on
10 said terminals.

12. A phonogram reproducing apparatus including a base block, a head plate, a rec-

ord cylinder, sealing members removably embedded in said block and plate, and means for exerting pressure directly on and be- 15 yond the head plate to cause sealing co-operation between said members and the extreme ends of the cylinder.

In testimony whereof, I affix my signature in presence of two witnesses.

WILLIAM F. MESSER.

Witnesses:

O. L. NEFF,

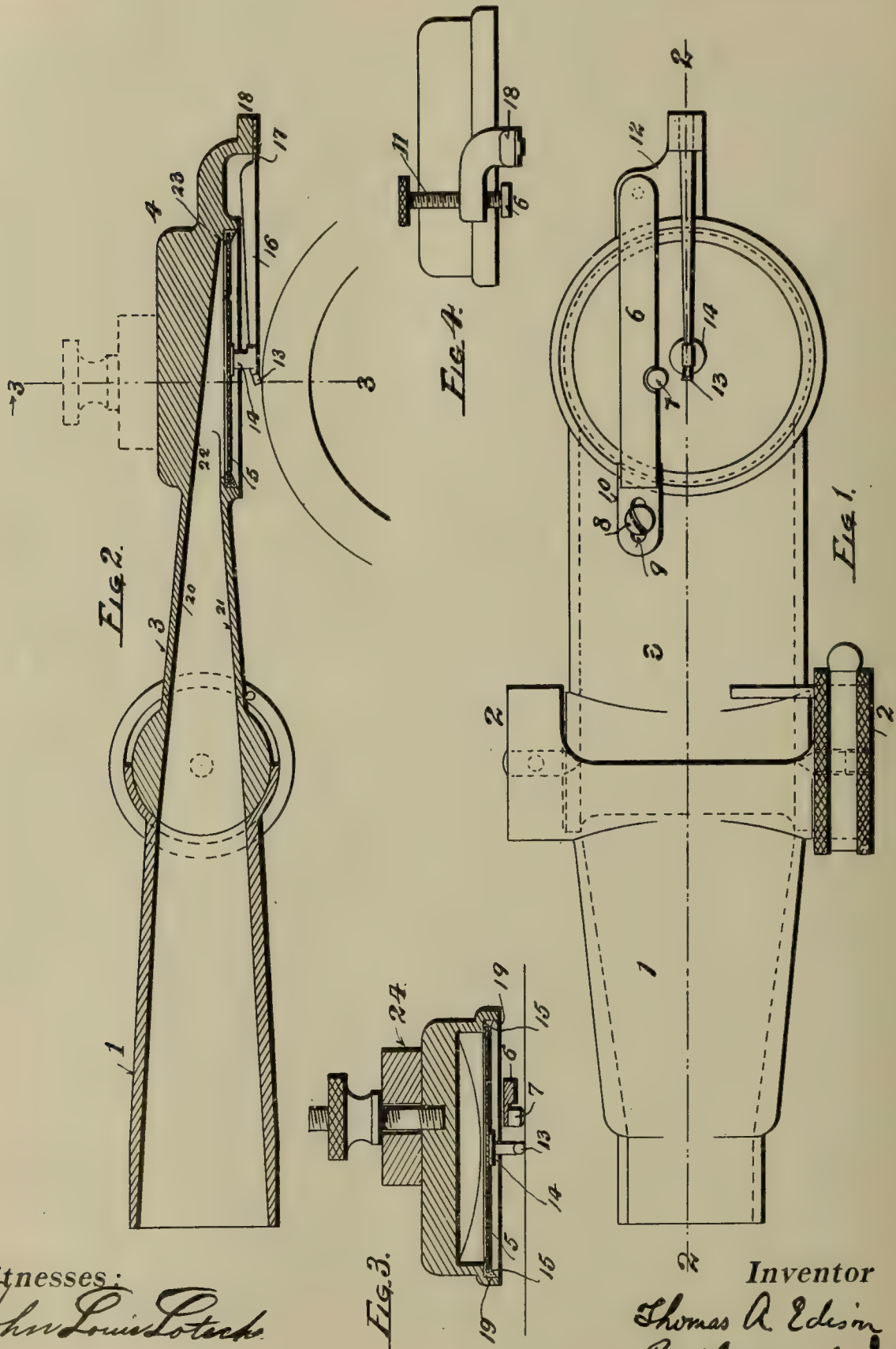
CHAS. E. FERRELL.

T. A. EDISON.
 APPARATUS FOR RECORDING SOUNDS.
 APPLICATION FILED NOV. 13, 1903.

962,081.

Patented June 21, 1910.

2 SHEETS—SHEET 1.



Witnesses:
John Louis Lottick
Geo. Robt Taylor

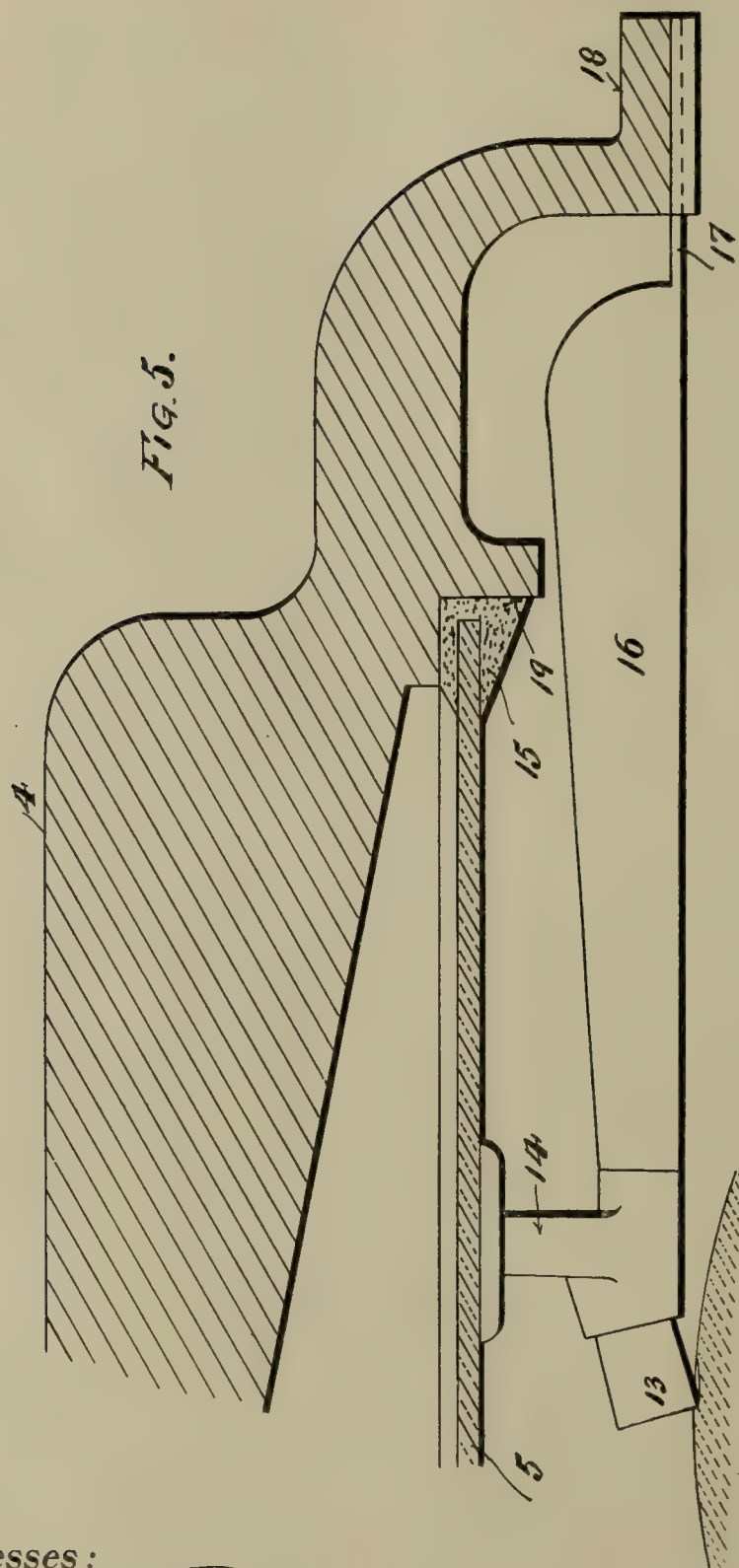
Inventor
Thomas A. Edison
 By *Hank L. Spurr*
 Attorney.

T. A. EDISON.
APPARATUS FOR RECORDING SOUNDS.
APPLICATION FILED NOV. 13, 1903.

962,081.

Patented June 21, 1910.

2 SHEETS—SHEET 2.



Witnesses:

John Louis Lotick
Geo. Robt Taylor

Inventor

Thomas A. Edison
By Frank L. Popen
Attorney.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, ORANGE, NEW JERSEY, ASSIGNOR TO
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NEW JERSEY.

APPARATUS FOR RECORDING SOUNDS.

962,081.

Specification of Letters Patent. Patented June 21, 1910.

Application filed November 13, 1903. Serial No. 180,998.

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, of Llewellyn Park, Orange, in the county of Essex and State of New Jersey, have invented certain Improvements in Apparatus for Recording Sounds, of which the following is a description.

My invention relates to improvements in apparatus for recording sounds, particularly of that type in which phonographic records are formed, and which records are of varying depth, but the invention may be employed in connection with records of the gramophone type, which are of uniform depth but of irregular conformation.

The object of this invention is to produce a recording mechanism capable of recording sound waves phonographically, as truly representative as may be of the original waves and their quality, eliminating excessive and false amplitudes of vibration, without any consequent loss in volume of the sound produced.

The invention consists in the production of a phonographic device whereby sound waves throughout the range of music may be recorded and reproduced truly, false amplitudes of vibration of the recording mechanism being eliminated, and the recording and reproduction of both grave fundamental notes and overtones rendered possible.

The invention further consists in the various details of construction for the improvement of phonographic recorders generally, as more fully set forth hereafter in the specification and the appended claims.

At the present time those skilled in the art have been unable to record and reproduce music having all the tones within the range of music sufficiently like the original to obtain a record that is salable commercially; this is especially true of music of the piano, and, notwithstanding many millions of phonograph records have been made and sold, records formed of piano music alone are not sold and are not found in any catalogue of the manufacturers. With recording instruments existing before this invention, it is impossible to produce a satisfactory piano record. If it is attempted to record the overtones which give music its pleasing qualities, the instrument must be made very sensitive, as the waves which

form overtones are many times weaker than the fundamentals. If the recorder is made sufficiently sensitive to so record these overtones, the powerful fundamental tones of the bass act so violently upon the recorder as to throw the recording knife out of the recording material in the case of cylindrical records and give excessive amplitudes in the case of flat records. If the recorder is made so insensitive as to prevent this latter action no overtones are recorded and the quality is lost. While at the present time manufacturers of cylindrical records use the piano as an accompaniment, the deep bass notes are never used, but only those in the higher register; in addition the vibrating part of the recorder itself is sympathetic to the graver tones and serves only to intensify these serious defects. I have by exhaustive experimentation discovered that the true sound waves over the whole range of music from the most grave to the highest pitched tone do not actually have the amplitudes which are implied by the throwing of the recording knife out of contact with the record surface and the vibrating periods of the recorder itself need not necessarily be grave; that this is due to defective mechanism constructed upon a wrong principle and that if certain changes are made in the mechanism so that it will operate upon a different principle, it may be adjusted with sufficient sensitiveness to record the necessary overtones and the most powerful bass notes of a piano and permit the reproduction of the original tone with almost perfect quality and with a greater volume than has hitherto been thought possible. I have traced down and ascertained by experiment that the cause of the excessive and false amplitudes of vibration is due to the elasticity of the recording mechanism itself and by eliminating the principal part of this elasticity, the true amplitudes due to the sound waves do not cause the recording knife to be thrown from the recording surface when the recorder is rendered sufficiently sensitive and that the grave tones of the diaphragm may be changed to a higher rate and of such a small amplitude as not to distort the record.

The ordinary recording mechanism now in general use consists of a circular diaphragm generally of glass about $1\frac{1}{4}$ inches in

diameter and from .005 to .007 of an inch in thickness. This diaphragm is secured to a chamber by being placed between two or more rings of rubber at its edges and clamped or cemented to the edge of such opening. The recording knife is generally fastened to the center of the diaphragm and connected to a lever secured to the edge of the chamber to take the thrust of the knife in cutting the record. The elastic members of this device are two, viz: the glass disk which is flexed by the pressure of the sound waves and the elastic rubber which is strained by the flexing of the disk. For the purposes of illustration let such a disk be cut in sections like the spokes of a wheel, there will be a number of vibrating reeds each elastic and flexing by itself as well as flexing by distortion of its rubber support, and sympathetically resonant to some tone in the lower register of the piano, harp or similar instrument. Independent of the fact of its having a tone or vibrating period, it has a mass and possesses weight and if moved by a force applied at the end of such a section a large amount of the power applied must be used in distorting the rubber clamp in addition to that used for flexing the section, and this mass under the action of the stored power in the rubber tends to make several movements when only a single impulse was given to its end; thus it cannot possibly follow the sound waves of music. If a number of impulses are applied to the end which impulses have the same period of vibration as the section itself, the amplitude due to the first few waves will be less than the following waves, although the original sound waves may all have the same amplitude, hence there can be no true record of a tone the same as that of the sector, and this is true of the whole diaphragm which is formed of a large number of sections, so to speak. It is impossible to make the rubber clamps of uniform elasticity, hence there will be many parts or sections of the diaphragm with different vibrating periods. Even in the case of waves having vibrating periods unlike the diaphragm, their action on the diaphragm causes energy to be stored up in the elastic clamp, and the action of this stored energy on the mass of the diaphragm tends to force it to make more vibrations than there are sound waves, producing interference and false amplitudes not corresponding to the sound waves, and a large proportion of the energy contained in each sound wave is lost as heat in deforming the rubber (which extends around the periphery of a circle about $3\frac{3}{4}$ inches in circumference), which energy, if applied to flexing the very elastic glass would greatly increase the volume of sound, and permit of the recording of the exceedingly weak overtones. I may mention that the heat lost by

distorting rubber is very much greater than by distorting glass, as the latter is a substance of great elasticity and minimum internal friction, while rubber is just the contrary. The recorder in general use is also defective by reason of certain other causes which coöperate to produce distortion of the diaphragm. First, the diaphragm is placed under strain by the pressure which is necessary to force the recording knife into the record material. This pressure varies not only with the material but with different degrees of hardness occurring upon different parts of the surface of the record material. Second, the record itself cannot be made to run absolutely true. These two causes work in conjunction to produce an ever varying flexure of the diaphragm, independent of the action of the sound waves, and this continuous flexure of itself distorts the record produced by the sound waves. Third, the fact that the fundamental tone of the diaphragm and its elastic support is grave and of great amplitude, and constantly varies as the tone is prolonged, produces additional distortion.

In the recorder of my invention, a very wide departure in construction is made. The diaphragm is not secured at the edges but floats in a mass of viscous liquid or semi-liquid material. The diaphragm is secured at its center to one end of a reed which is supported at its other end by an elastic connection from the chamber, and has the recording knife fastened at its end about the center of the diaphragm. When assembled the diaphragm and knife are afloat so to speak, and are sustained entirely by the supported end of the reed. The viscosity of the semi-liquid material around the edges is such that when the recorder is adjusted so the knife tracks the record material to the proper depth, the diaphragm will have no stress upon it. It is in its most sensitive condition, and if the record cylinder is eccentric or a part of the record harder than another part, the viscous liquid offers scarcely any resistance to a motion of translation to such slow movements but on the other hand acts nearly as a rigid body to movements of great frequency similar to sound waves. The edge of the diaphragm makes scarcely any movement and yet is free of all strain whereas if the record is untrue the edge of the diaphragm may make movements several times greater than those produced by the sound waves. Thus no matter what variation in the hardness of the material or what reasonable amount of eccentric motion of the record takes place, the diaphragm is unstressed and in its most sensitive condition. The viscous semi-liquid material acts to close the chamber completely and thus permits of a rise and fall of barometric pressure which permits sound waves, and

being non-elastic no energy is stored up to distort the sound waves, and the amount of energy abstracted is less than if the diaphragm were between rings of rubber or other elastic material, and such energy is not returnable to the mechanism as motion to produce distortion. In addition, this want of elasticity changes the fundamental note of the diaphragm and environment from a grave note of high amplitude to a very much higher note and of a greatly reduced amplitude so much reduced that the combined effect of the sound wave and the diaphragm in tune with it is entirely insufficient to throw the knife from the record or disturb in an appreciable amount the quality of the recorder sound. The viscosity of the material used around the edges is such that its surface tension prevents it from flowing to any extent at ordinary temperature at slight gravity gradients, hence the recording apparatus if kept level will be serviceable for several days and then the viscous semi-fluid material is quickly and easily renewed.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a bottom view of the recorder; Fig. 2 is a sectional view thereof taken on the line 2—2 of Fig. 1; Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2; Fig. 4 is a front view of the body; and Fig. 5 is an enlarged sectional view of the body, diaphragm and recording knife.

In all of the above views corresponding parts are represented by the same numerals of reference.

The hollowed tube 1, which is connected to, or is a continuation of the usual horn or funnel, is carried by the usual support (not shown) and has ears 2—2 between which is pivoted the head or barrel 3. To the latter is secured the sound box or body 4 to the lower face of which is connected the glass or mica diaphragm 5. Across the lower face of the body and below the diaphragm is the tracking lever 6, which serves as a support for the ball 7, which latter rests upon the record cylinder and supports the body, allowing it to oscillate about the pivot between the ears 2—2 and accommodate itself to all large irregularities in the surface of the blank.

The ball 7 is of a comparatively little curvature, but sufficient to permit of universal adjustment, and is preferably made of a jewel, of which sapphire seems to be the best material, as it does not have any appreciable chemical effect upon the record blank; furthermore it is susceptible of taking a high polish, so that its passage over the record will not scratch or otherwise injure it.

The lever 6 is connected to one end of the body 4, by means of a screw 8, which passes through a slot 9 formed within an elastic extension 10 of the lever which forms an elastic connection, so that the lever, together with the ball 7 may be adjusted in relation to the center of the diaphragm. The other extremity of the lever engages with an adjusting screw 11, passing through a threaded opening in an extension 12 on the body, and by means of which the relative position of the ball 7 and the body may be adjusted when the machine is running.

The knife 13 is attached to the diaphragm adjacent to its center and on the same line of travel as the ball 7, by means of a support or foot 14 which is formed preferably of magnesium on account of lightness. The foot 14 is secured to the diaphragm by a suitable cement, such as melted shellac.

The diaphragm is connected at its periphery to the bottom of the chamber or body by means of a mass of viscous or semi-liquid material 15, so that it will be entirely supported against gravity and the thrust of the cutting knife solely by the elastic reed 16, the material 15 forming a seal to close the joint between the edges of the diaphragm and the chamber. The reed is preferably made of white pine or similar light wood and is of a varying vertical section, deeper than it is wide and is secured to the foot 14 by a cement, preferably melted shellac.

The end of the reed at 17 is made much thinner, so that it will vibrate easily and the reed increases gradually in vertical dimensions, toward the fixed extremity, the configuration of the entire reed being such that it will be practically unsympathetic with any note of great amplitude, and on account of the varying vertical section will give no harmonics that would tend to disturb the record. The end 17 of the reed is secured to a pillar 18 formed upon a continuation of the body 4.

The stiffness of the reed at 17 should be sufficient, so that the act of tracking the knife in the record will not cause the edge of the diaphragm to be forced against the edge of the body 4, but only moved in the viscous liquid. The knife illustrated is of usual form. The reed 16 forms a continuation of the knife, and is in the direct line of thrust caused by the action of the record upon the knife. When the reed is arranged at an angle to the thrust caused by the action of the record on the knife, the knife has a tendency to "chatter" which injuriously affects the record.

The mass of viscous or semi-fluid material 15 does not serve to support the diaphragm against gravity, but serves as a moving point or points about which the diaphragm vibrates. It is necessary to keep the quantity of viscous material in use in the manner

shown, down to the smallest quantity to permit of its surface tension being sufficient to hold it up in position, and not flow to any appreciable extent by gravity. Of the many
 5 viscous or semi-liquid materials experimented upon, that produced by burning pure crude para-rubber is the best. A piece about $\frac{1}{4}$ of an inch thick and two inches long is set on fire at one end and as it softens
 10 and melts it is rubbed while still burning upon the edge of a dish. In character it resembles a thick varnish, it has great surface tension and great viscosity, it is not changed by action of the atmosphere and altogether
 15 is a peculiar substance and well adapted for the purpose. It can be produced of varying degrees of viscosity by a proper manipulation of the heat and thus give a range for varying conditions. The space between the
 20 inner edge of the diaphragm and the body 4 will usually be .020 of an inch and between the edges of the diaphragm and the inside encircling flange 19 about .010 of an inch and below the lower edge of the diaphragm
 25 and the flange 19 should project a sufficient distance to hold the viscous material. These dimensions can be varied to meet varying conditions.

The form of recorder which I have devised and which is illustrated in Figs. 1 and 2 also has some advantages over that in common use, as the chamber for producing the final pressures upon the diaphragm is small and of a proper proportion, and is so
 35 arranged in relation to the receiving funnel or horn that the sound waves do not suffer either partial or total deflection at any point and at the same time the wall friction is reduced. This is accomplished by forming the head or barrel 3 of the same width
 40 practically throughout (see Fig. 1) and not tapering it as it laterally enters the body 4 as has hitherto been the practice. The top and bottom 20 and 21 respectively of the
 45 opening within the head 3 approach as they near the diaphragm, but the sides do not. The top 20 of the head forms a line practically continuous with the upper surface 22 of the inside of the body 4, which upper
 50 surface inclines from a point co-incident with the connection of the head, to the other edge of the diaphragm at 23; and there are no angles or obstructions in the path of the sound waves. By connecting the head 3
 55 with the side of the body 4, the air passage way is straight, consequently the sound waves do not suffer any deflection, and by the use of the proper funnel angle the power of the sound waves to act upon the diaphragm is greatly increased.

A small weight 24 is preferably removably carried on the head 4, and which may be changed or varied to suit the conditions of work, or character of sound required.

65 The center of gravity of the weight should

ordinarily be directly over the center of the tracking ball 7.

By adjusting the position of the ball 7 upon the record by means of the screw 11, the whole recorder can rapidly and easily
 70 be made to approach and recede from the face of the recording material and thus permit of the adjustment of tracking of the recording knife to the required depth into the record material after the machine is started.
 75 In the act of forcing the knife into the record material, the reed 16 is flexed at its point of fastening 17. If the reduced section of the reed at 17 is made stiff the reed as a whole will be very little flexed and there
 80 will be but a slight movement of the edge of the diaphragm in the viscous semi-liquid material, and during the act of flexing of the reed, the diaphragm will also be flexed due to the retardation of its movement
 85 through the viscous liquid, but when the knife is once tracked all stress on the diaphragm is removed. To rapid movements, like sound waves, the resistance to motion is powerful and the diaphragm has little, if
 90 any, to and fro movement at its edges, the recording being due almost entirely to flexing of the diaphragm.

If the part 17 of the reed is made very thin, the reed will be flexed to a greater
 95 extent and the movement of the diaphragm in the viscous liquid will be greater, but in no case will the edge of the diaphragm touch the metallic parts, but will always be free and immersed in the liquid. A movement of more than .02 of an inch will
 100 seldom be required and the proportions illustrated should be sufficient to permit of movements of this amount. The thickness of the reed at 17 is easily changed, and
 105 serves to adjust the sensitiveness of the whole vibrating portion of the recorder and the energy stored up in the elasticity of that portion of the reed at 17 is quite small as compared to that of a diaphragm clamped
 110 in rubbers at its edges, hence the movements of the vibrating apparatus due to its own elasticity or capacity to return the stored up energy is very small and negligible and therefore the full effect of the condensations
 115 and rarefactions of the sound waves comes into full play without the disturbance produced by elastic mechanism of the recorder mechanism as now used.

It is obvious that the principle of operation can be varied in many ways and that it can be employed for recording on machines of the disk form, to prevent the making of a record of excessive amplitudes, produced by the conjunction of the sound waves and elastic recording mechanism and which the reproducing needle does not and cannot follow, but jumps across, and also to record the sound more perfectly, to strengthen the overtones and increase the volume of sound.
 120
 125
 130

While I have described my improvements as being particularly designed for use in apparatus of the phonograph type, it will be understood that parts of it may be used in
5 any art in which diaphragms are employed for recording or transmitting sounds.

In the various claims, it is to be understood that wherever the term "liquid material" is used, denoting the means by which
10 the periphery of the diaphragm is connected to the sound box, a generic construction is to be given the same, including substances which flow more or less readily, some of which are sometimes termed semi-liquid materials, the consistency of the material being
15 only determined by the qualification that it must be characterized by great internal friction or viscosity.

Having now described my invention, what
20 I claim as new and desire to secure by Letters Patent, is as follows:

1. In a device for recording sound waves, a vibratory plate or disk connected to a frame by a permanently liquid material
25 which is characterized by great internal friction or viscosity, substantially as set forth.

2. In a device for recording sound waves, a vibratory plate or disk connected to a frame by burnt rubber, substantially as set
30 forth.

3. In a device for recording sound waves, a vibratory plate or disk, the edges of which are connected to a frame by a permanently liquid material which is characterized by
35 great internal friction or viscosity, substantially as set forth.

4. In a device for recording sound waves, a vibratory plate or disk supported at or near its center and connected to a frame by
40 a permanently liquid material which is characterized by great internal friction or viscosity, substantially as set forth.

5. In a device for recording sound waves, a vibratory plate or disk supported at or
45 near its center and connected to a frame by burnt rubber, substantially as set forth.

6. In a device for recording sound waves, the combination of a record surface, a diaphragm and stylus capable of moving as a
50 whole toward and away from said surface and a reed connected at one end to the diaphragm and at its other end to a support and operating to support the diaphragm and by flexure to permit movements of the diaphragm, substantially as set forth.
55

7. In a device for recording sound waves, the combination of a record surface, a diaphragm and stylus capable of moving as a whole toward and away from said surface, a
60 reed connected at or near one end to the diaphragm and at its other end to a support and operating to support the diaphragm and by flexure to permit movements of the diaphragm, said reed extending longitudinally
65 in line with the thrust of the record sur-

face upon the recording stylus, substantially as set forth.

8. In a device for recording sound waves, the combination of a sound box having an opening, a diaphragm occupying a position
70 within said opening and a seal between said diaphragm and opening composed of a permanently liquid material characterized by great internal friction or viscosity, substantially as set forth.
75

9. In a device for recording sound waves, the combination of a sound box having an opening, a diaphragm occupying a position within said opening and a seal between said diaphragm and opening composed of burnt
80 rubber, substantially as set forth.

10. In a device for recording sound waves, the combination of a sound box having an opening, a diaphragm within said opening, a support connected to said diaphragm at
85 or near its center and a seal between said diaphragm and opening composed of a permanently liquid material having great internal friction or viscosity, substantially as set forth.
90

11. In a device for recording sound waves, the combination of a sound box having an opening, a diaphragm within said opening, a support connected to said diaphragm at or
95 near its center and a seal between said diaphragm and opening composed of burnt rubber, substantially as set forth.

12. In a device for recording sound waves, the combination of a vibratory diaphragm connected to a frame by a permanently
100 liquid material characterized by great internal friction or viscosity, and a reed connected at one end to the diaphragm and at its other end to a support, and operating by flexure to permit movements of the diaphragm, substantially as set forth.
105

13. In a device for recording sound waves, the combination of a vibratory diaphragm connected at or near its edges to a frame by a permanently liquid material, characterized
110 by great internal friction or viscosity, and connected at or near its center to a vibratory support, substantially as set forth.

14. In a device for recording sound waves, the combination of a vibratory diaphragm
115 connected at or near its edges to a frame by burnt rubber, and connected at or near its center to a vibratory support, substantially as set forth.

15. In a device for recording sound waves, the combination of a record surface, a diaphragm and stylus capable of moving as a whole toward and away from said surface, and a reed of tapered vertical section connected at one end to the diaphragm and at
125 its other end to a support, and operating to support the diaphragm and by flexure to permit movements of the diaphragm and stylus, substantially as set forth.

16. In a device for recording sound waves, 130

the combination of a record surface, a diaphragm and stylus capable of moving as a whole toward and away from said surface, and a wooden reed connected at one end to the diaphragm and at the other end to a support and operating to support the diaphragm and by flexure to permit movement of the diaphragm and stylus, substantially as set forth.

17. In a device for recording sound waves, the combination of a record surface, a diaphragm and stylus capable of moving as a whole toward and away from said surface, and a reed connected at one end to the diaphragm and having its other end of reduced section and connected to a support, said reed operating to support the diaphragm and by flexure to permit movement of the diaphragm and stylus, substantially as set forth.

18. In a device for recording sound waves, the combination of a record surface, a diaphragm, a stylus moving toward and away from said surface and a reed of tapered vertical section connected to said diaphragm, and having its other end of reduced section and connected to a support and operating by flexure to permit movements of the diaphragm and stylus, the largest vertical section of the reed being adjacent the reduced portion, substantially as set forth.

19. In a device for recording sound waves, the combination of a sound box having an opening closed by a diaphragm and a second opening for receiving the sound waves, said latter opening being substantially equal in width to the diaphragm opening, substantially as set forth.

20. In a device for recording sound waves, the combination of a sound box having an opening closed by a diaphragm and a second opening for receiving the sound waves, said latter opening being substantially equal in width to the diaphragm opening and situ-

ated at one side thereof, substantially as set forth.

21. In a device for recording sound waves, the combination of a sound box having an opening closed by a diaphragm and a second opening communicating with a passage for conveying the sound waves, said latter opening being substantially equal in width to the diaphragm opening and situated at one side thereof, and the lateral walls of the said passage being parallel, substantially as set forth.

22. In a device for recording sound waves, a sound box having an opening in which the diaphragm is situated, a wall opposite said opening, and a second opening at one side of the diaphragm opening, said walls sloping uniformly from a point adjacent the second opening to a point adjacent the far edge of the diaphragm, substantially as set forth.

23. In a device for recording sound waves, the combination of a sound box having an opening in which the diaphragm is situated and a sound conveying tube opening into the side of said box, the upper and lower walls of said tube and sound box converging as they approach the diaphragm, substantially as set forth.

24. In a device for recording sound waves, the combination of a sound box having an opening in which the diaphragm is situated and a sound conveying tube opening into the side of said box, the upper and lower walls of said tube and sound box converging as they approach the diaphragm and the top of the sound box being practically a continuation of the upper wall of the tube, substantially as set forth.

This specification signed and witnessed this 11th day of November 1903.

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Witnesses:

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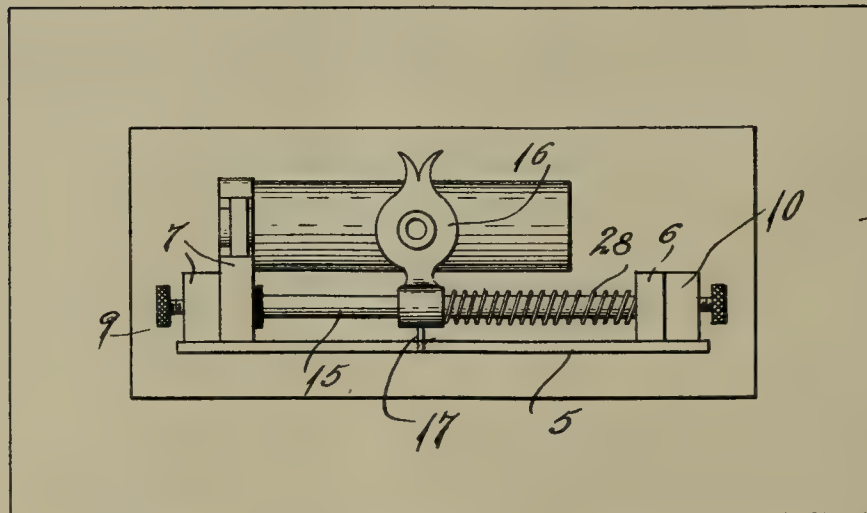
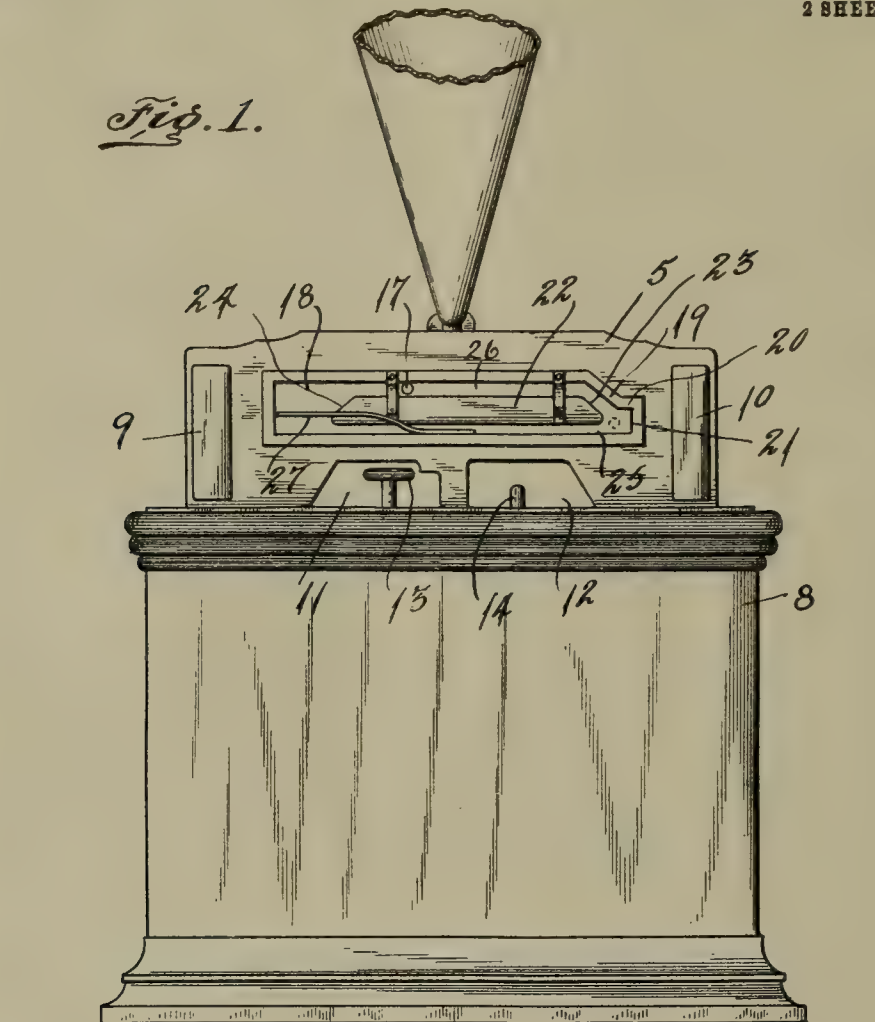
C. W. CLAUD.
 REPEATING ATTACHMENT FOR GRAPHOPHONES.
 APPLICATION FILED MAY 22, 1909.

962,315.

Patented June 21, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



Inventor

Fig. 4.

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By

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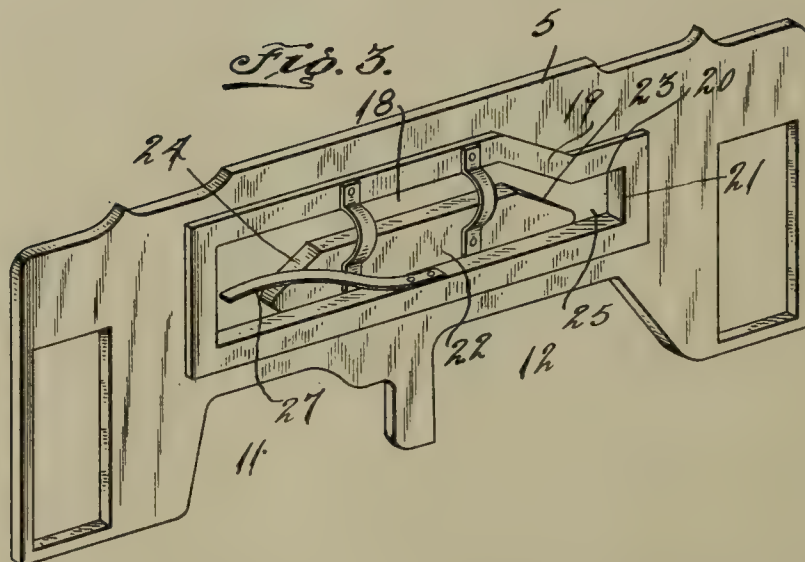
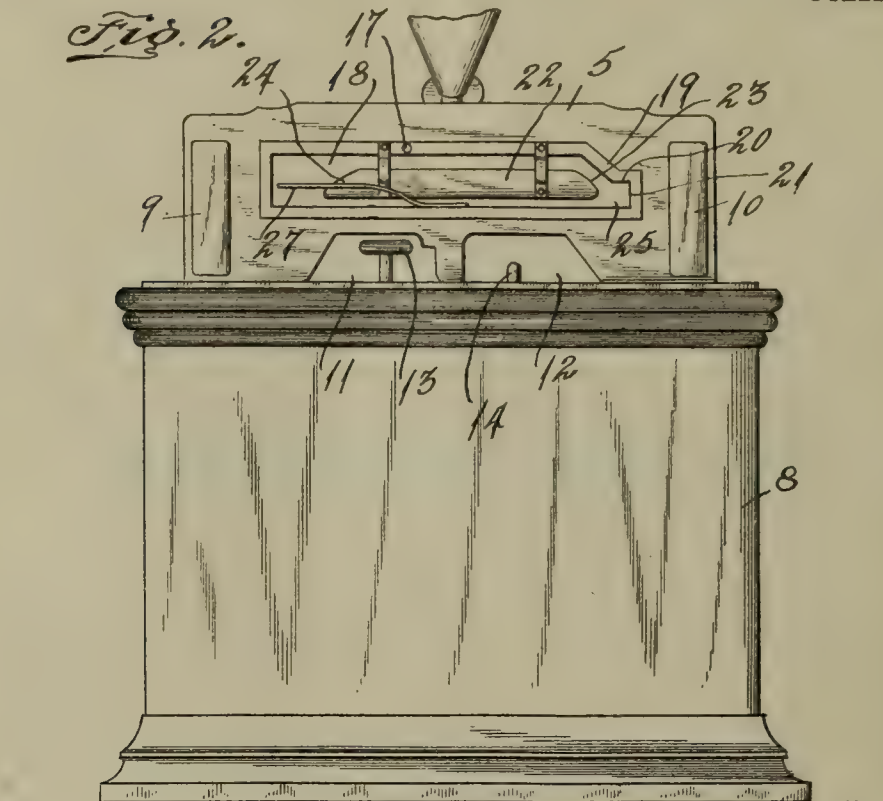
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 REPEATING ATTACHMENT FOR GRAPHOPHONES.
 APPLICATION FILED MAY 23, 1909.

962,315.

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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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REPEATING ATTACHMENT FOR GRAPHOPHONES.

962,315.

Specification of Letters Patent. Patented June 21, 1910.

Application filed May 22, 1909. Serial No. 497,580.

To all whom it may concern:

Be it known that I, CLARENCE W. CLAUD, a citizen of the United States, residing at Nashville, in the county of Davidson, State of Tennessee, have invented certain new and useful Improvements in Repeating Attachments for Graphophones; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to attachments for graphophones and particularly to that class of instruments employing a cylinder record.

One object of the invention is the provision of a means for shifting the carriage from one end of a record to the opposite end and thence bringing the needle into engagement with the cylinder to repeat the matter on the record.

Another object is the provision of a means for lifting the needle clear of the record during the shifting movement and for bringing the same into engagement with the record at the end of the shifting movement.

A further object is the provision of a means for automatically accomplishing the above mentioned objects. And a still further object is the provision of a device which may be applied to most forms of graphophones now in use without changing the construction of the same.

With these and other objects in view as will more fully hereinafter appear, the present invention consists in certain novel details of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings and more particularly pointed out in the appended claims, it being understood that various changes in the form, proportion, size and minor details of the device may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings forming part of the specification:—Figure 1 is a front elevation of a graphophone showing the invention applied thereto and the needle held in engagement with the cylinder. Fig. 2 is a similar view but showing the position of the parts when the needle is out of engagement with the cylinder or during the

shifting movement. Fig. 3 is a detailed perspective of the plate and its attachments. Fig. 4 is a plan view of the device.

Similar numerals of reference are employed to designate corresponding parts throughout.

The invention consists primarily in a repeating device designed to repeat the contents of a cylinder over and over again without the necessity of manually operating the carriage and as shown in the drawings a vertically disposed base plate 5 between the carriage frame posts 6 and 7 is disposed on the upper face of the box 8. The plate 5 is oblong and provided on one face and at its opposite ends with wedge blocks 9 and 10, the opposed inner sides of which are designed to bear against the opposite outer sides of the posts 6 and 7 in order to secure the plate 5 in vertical position, as shown in Figs. 1 and 2. The lower longitudinal side of the plate 5 is provided with notches 11 and 12 which receive the controlling screw 13 and operating lever 14 disposed on the upper face of the box.

The carriage slide is designated by the numeral 15 and the carriage which slides thereon by the numeral 16. The carriage lever is shown at 17 as extending outwardly from the carriage and slide bar and performs the usual function of raising and lowering the carriage from and into engagement with the cylinder.

The plate 5 is medially provided with a longitudinal opening 18 which receives the carriage lever 17. The opening 18 is sufficient in length to permit the carriage lever to move therein from one end of its journey to the other over the face of the record. The end wall of the opening 18 which lies adjacent the finishing end of the cylinder is inclined outwardly as shown at 19, for a portion of its length and thence extended outwardly and parallel with the lower side as shown at 20, the parallel portion 20 terminating in a downward extension 21 parallel with the opposite end wall.

What will subsequently be termed a guide block is designated at 22. This block is substantially the shape of a trapezoid in contour having its longer and parallel sides parallel with the longitudinal sides of the

opening 18 and its opposite ends 23 and 24 inclined outwardly and in opposite directions. The length and width of the block is considerably less than that of the opening 5 18 and it is so disposed within the opening that its lower longitudinal side forms a narrow guide opening 25, with the corresponding side of the opening 18 and a similar guide opening 26 is formed by the upper 10 longitudinal side of the block and upper side of the opening 18. Connection between the block and face of the plate may be made in any manner and in the present instance substantially U shaped straps are shown 15 having their terminals secured to the face of the block and the face of the plate.

As before stated, the opening 18 is designed to receive the carriage lever 17 and when in position and the carriage lowered 20 the lever extends through the opening and is in a plane with the opening 26. When the carriage is moved to the starting end of the cylinder or that end remote from the inclined end 19 of the opening, and begins 25 moving toward the opposite end of the cylinder, the free end of the lever will enter the guide opening 26. When the carriage arrives adjacent the finishing end of the cylinder, the free end of the lever will be in 30 engagement with the inclined end 19, and further movement of the carriage will result in the inclined end depressing the lever, whereby the needle will be lifted from engagement with the cylinder and movement 35 of the carriage stopped. When the parts are in these positions the lever will be in alinement with the lower guide opening 25, and in order to return the carriage to the starting end of the cylinder, the following 40 construction is employed:—By referring to Figs. 1 and 2, it will be seen that the carriage slide 15 is provided with a coil compression spring 28, which completely encircles the slide and has one end bearing 45 on the end post 6 or that end adjacent the finishing end of the cylinder and its opposite end bearing on the carriage 16. Thus it will be seen as the carriage and needle are moved over the surface of the cylinder 50 the spring will be compressed until the lever has been depressed as before described and is in alinement with the guide opening 25, whereupon the tension of the spring 28 will be sufficient to return the carriage to the 55 starting end of the cylinder.

After the carriage has been forced by the spring 28 to the starting end of the cylinder, it is obvious that some means must be provided for elevating the lever in order to 60 again bring the needle in engagement with the cylinder and in order to accomplish this result the following construction is employed:—By referring now to Figs. 1 and 2, it will be seen that a leaf spring 65 designated by the numeral 27, has one end se-

cured to the lower longitudinal side of the opening 18, and at a point substantially in alinement with the horizontal center of the block 22. The leaf spring is curved upwardly and outwardly as shown and its 70 free end is disposed adjacent that end of the opening 18 remote from the inclined end 19. Thus it will be seen when the carriage lever arrives at a point adjacent the end of the passage 25, it will bear on the 75 leaf spring 27, and when the lever has reached the end of the block 22, the spring will move upwardly and lift the lever, whereby the needle will engage with the cylinder. 80

From the foregoing it can be seen that I have provided a structure which is comparatively simple and inexpensive to manufacture and which can be readily applied to most forms of graphophones now in use. 85 It will be seen that the device operates positively to both raise and lower the carriage and shift the same. It will be understood that the spring motor which operates the graphophone will be sufficient to compress 90 the springs 27 and 28, it being understood that the tension of these springs will be proportioned accordingly.

Having thus described my invention, what is claimed as new, is: 95

1. In a repeating attachment for graphophones, the combination with the carriage, and carriage lever; of a plate having a guide opening for the carriage lever, a stationary member combined with said plate and co- 100 operating with the sides of the opening for operating the lever to raise and lower the carriage, and means for shifting the carriage from one end of the opening to the other end. 105

2. In a repeating attachment for graphophones, the combination with the carriage, and carriage lever; of a plate having a guide opening for the carriage lever, a stationary member carried by the plate and located in 110 the guide opening for automatically operating the lever to raise and lower the carriage, and means for automatically shifting the carriage from one end of the opening to the other end. 115

3. In a repeating attachment for graphophones, the combination with the carriage, and carriage lever; of a plate having a guide opening for the carriage lever, means disposed within the opening and coöperating 120 with the sides of the same for operating the lever to automatically raise and lower the carriage and means for shifting the carriage from one end of the opening to the other end. 125

4. In a repeating attachment for graphophones, the combination with the carriage, and carriage lever, of a plate having a guide opening for the carriage lever, means at one 130 end of the opening to depress the lever and

means for shifting the carriage to the opposite end of the opening and a leaf spring at the latter end for lowering the carriage.

5 5. In a repeating attachment for graphophones, the combination with the carriage, and carriage lever, of a plate having a guide opening for the carriage lever, means combined with said plate for automatically operating the lever to raise and lower the carriage and means embracing the carriage slide bar for automatically shifting the carriage from one end of the opening to the other end.

15 6. In a repeating attachment for graphophones, the combination with a carriage, and carriage lever; of a plate provided with an elongated opening, a block disposed within said opening having its sides spaced from the sides of the latter, whereby guide openings are formed for the reception of the carriage lever, means combined with the plate and serving to move the lever when the same has moved beyond one end of the block and means for shifting the lever to the opposite end of the block.

25 7. In a repeating attachment for graphophones the combination with the carriage, and carriage lever; of a plate provided with

an opening, one end wall of which is inclined, a block disposed in and spaced from the sides of said opening and having an inclined end parallel and spaced from the inclined end of the opening, whereby guide openings are formed for the reception of the carriage lever, means combined with the plate and serving to move the lever when the same has moved beyond one end of the block and means for shifting the lever to the opposite end of the block. 30 35

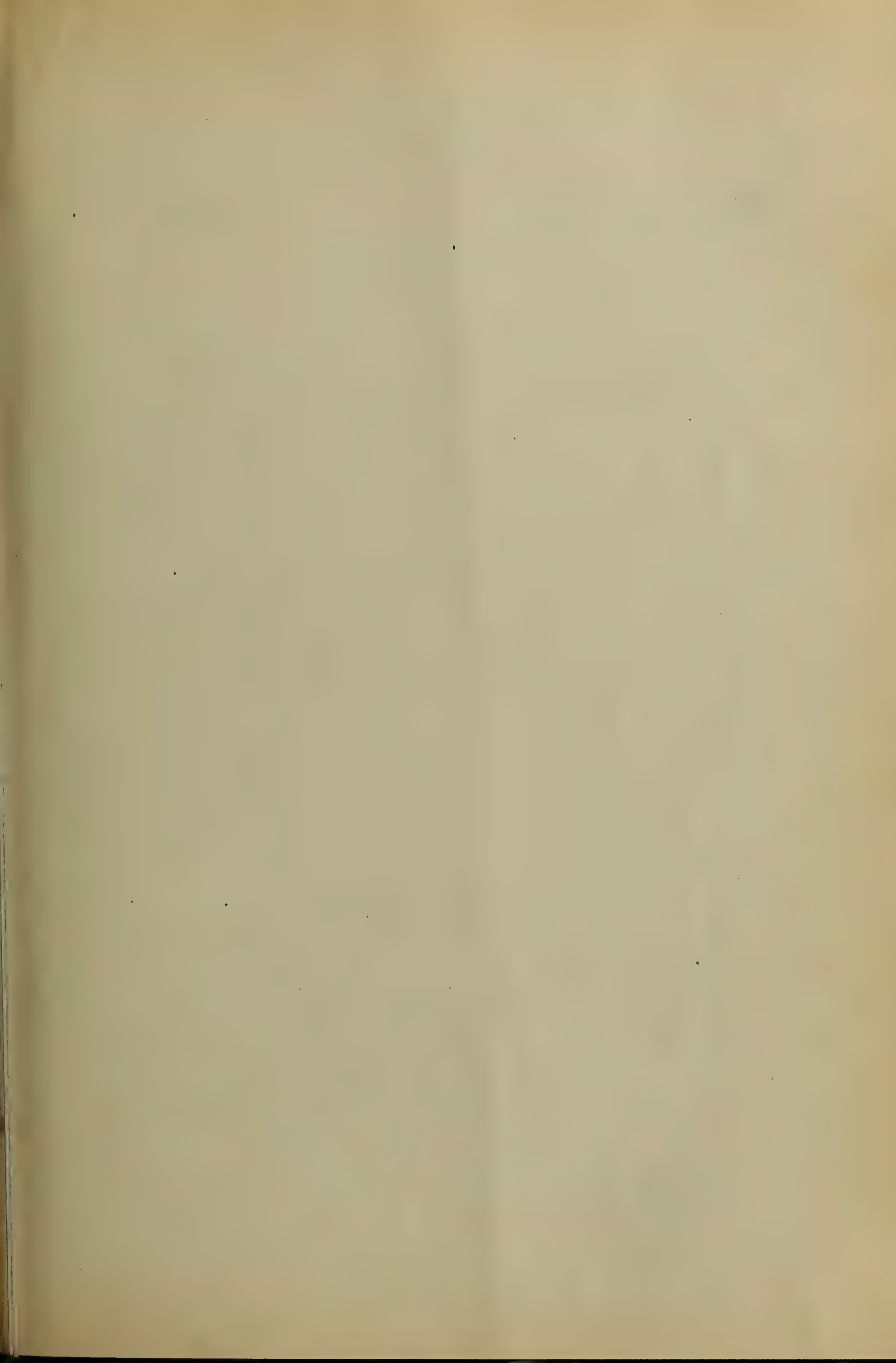
8. In a repeating attachment for graphophones the combination with a carriage and carriage lever; of a plate provided with an oblong opening corresponding approximately in length to the length of movement of the carriage, one side of said opening being provided adjacent one end with a lateral off-set adapted to depress the said lever to raise the carriage. 40 45

In testimony whereof, I affix my signature, in presence of two witnesses.

CLARENCE W. CLAUD.

Witnesses:

E. R. CARNEY,
GEO. N. FRAZIER.



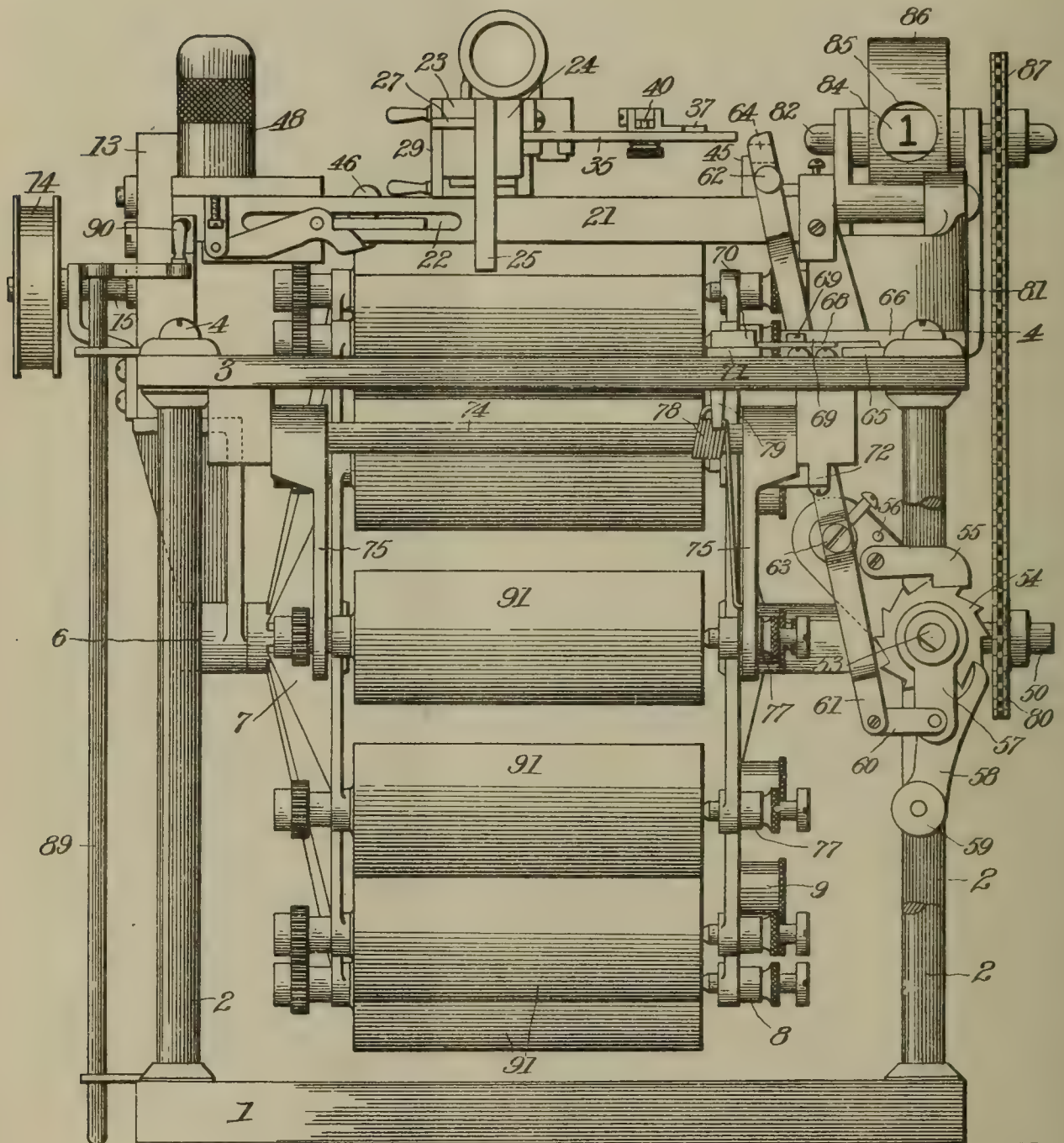
H. E. MARKLE.
MULTIPLEX GRAPHOPHONE.
APPLICATION FILED MAY 16, 1907.

962,446.

Patented June 28, 1910.

4 SHEETS—SHEET 1.

Fig. 1.



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1896

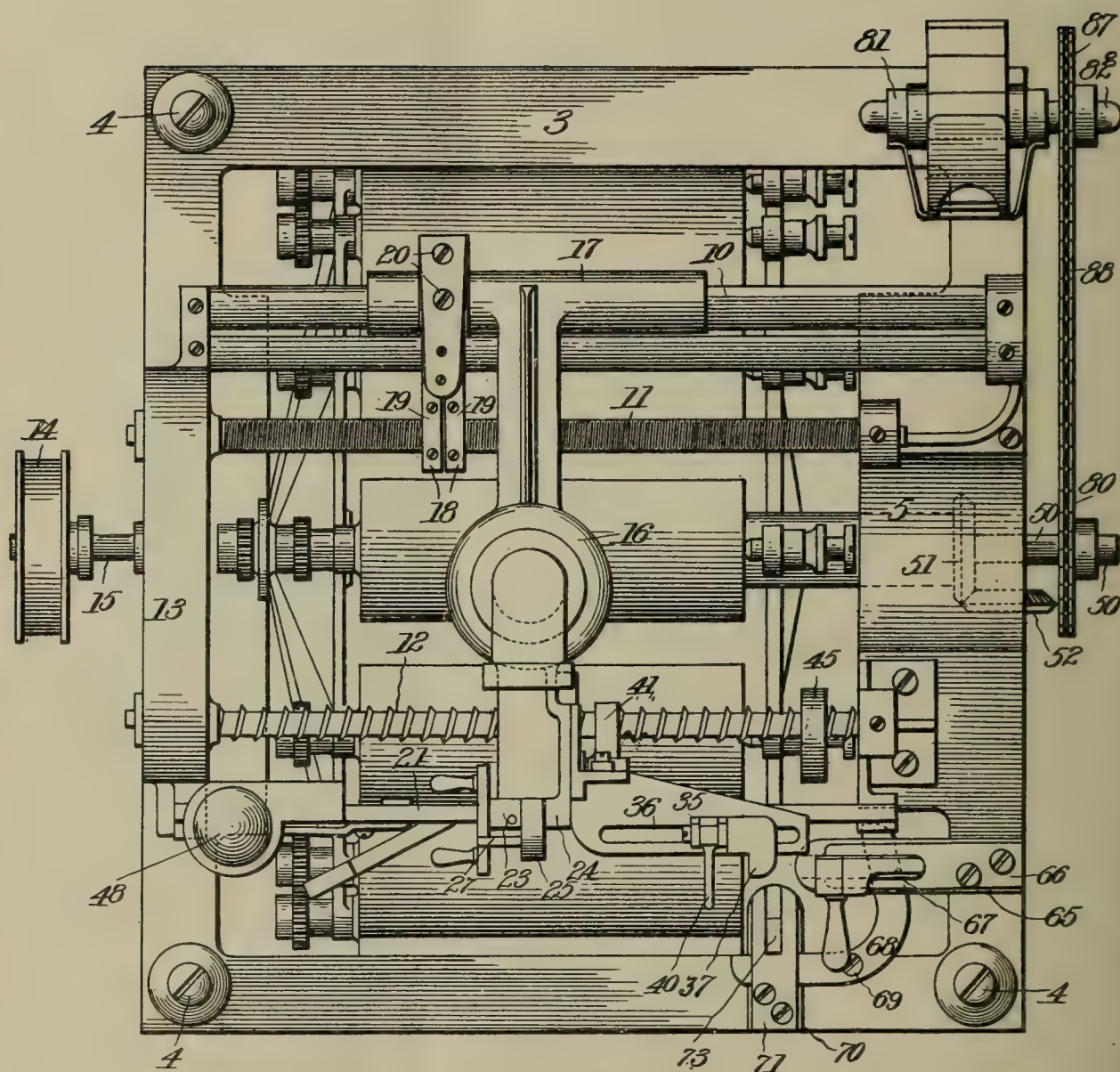
H. E. MARKLE.
 MULTIPLEX GRAPHOPHONE.
 APPLICATION FILED MAY 16, 1907.

962,446.

Patented June 28, 1910.

4 SHEETS—SHEET 2.

Fig. 2.



Witnesses

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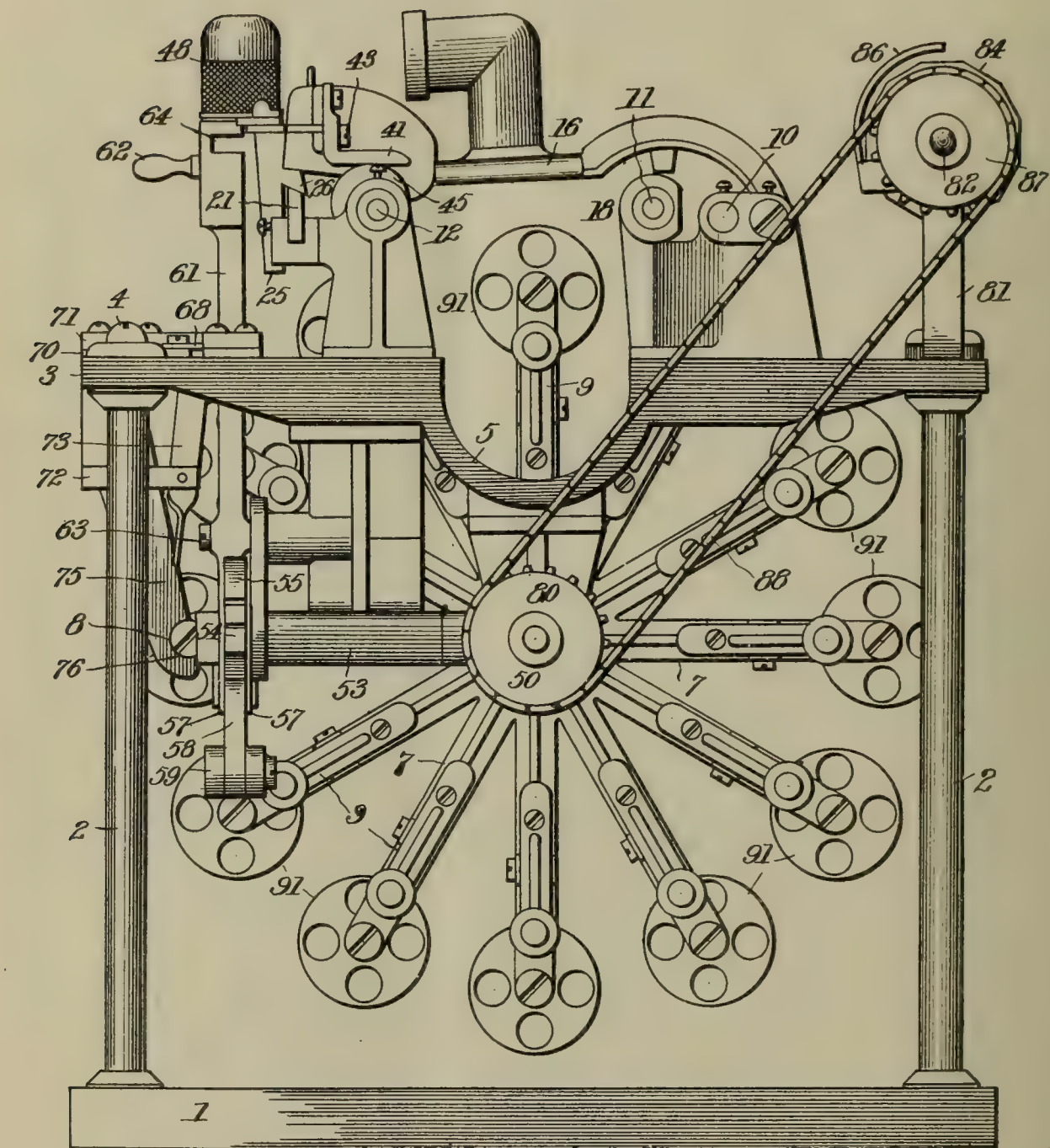
H. E. MARKLE.
MULTIPLEX GRAPHOPHONE.
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962,446.

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4 SHEETS—SHEET 3.

Fig. 3.



Witnesses

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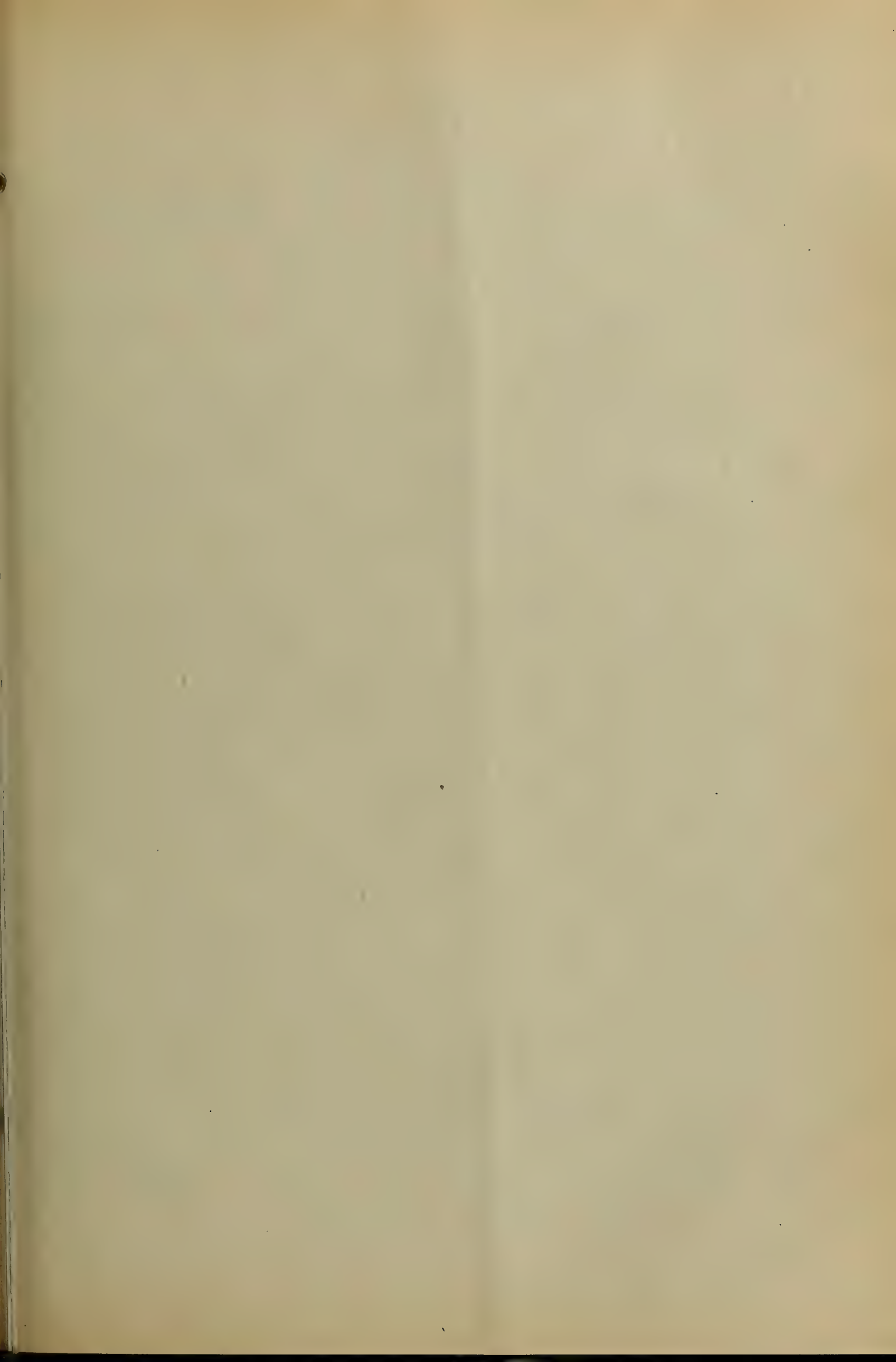
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Attorney

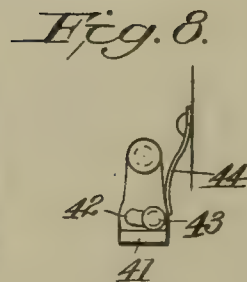
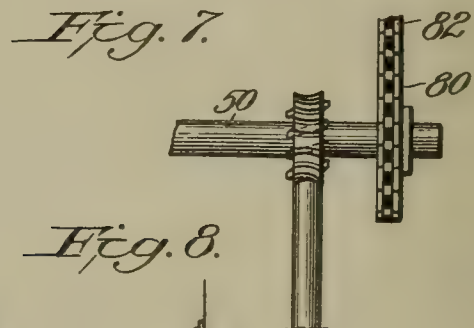
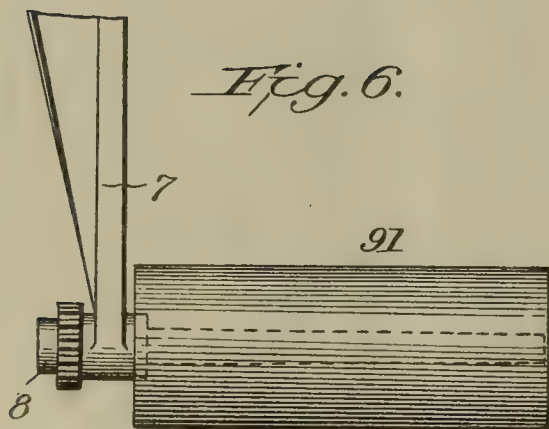
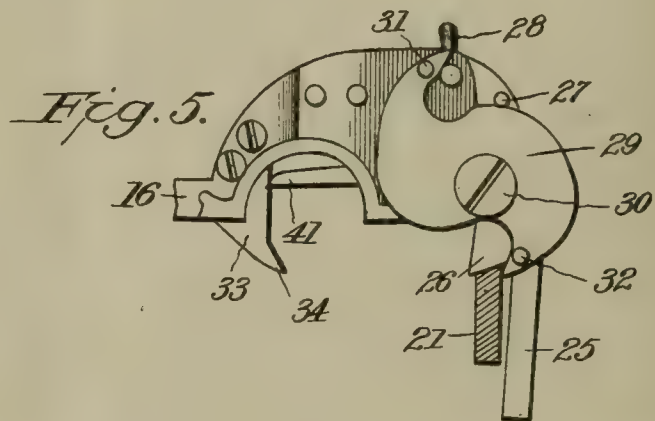
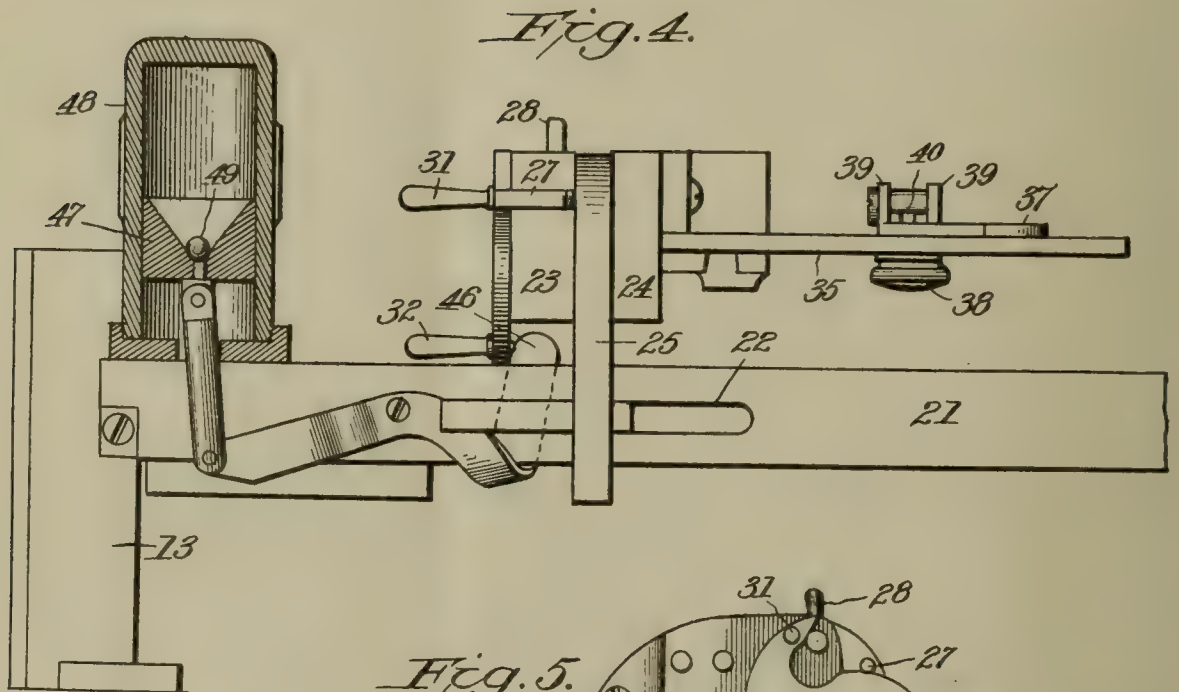


H. E. MARKLE.
 MULTIPLEX GRAPHOPHONE.
 APPLICATION FILED MAY 16, 1907.

962,446.

Patented June 28, 1910.

4 SHEETS—SHEET 4.



Witnesses
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UNITED STATES PATENT OFFICE.

HYMAN E. MARKLE, OF NASHVILLE, TENNESSEE.

MULTIPLEX GRAPHOPHONE.

962,446.

Specification of Letters Patent. Patented June 28, 1910.

Application filed May 16, 1907. Serial No. 374,013.

To all whom it may concern:

Be it known that I, HYMAN E. MARKLE, citizen of the United States, residing at Nashville, in the county of Davidson and State of Tennessee, have invented certain new and useful Improvements in Multiplex Graphophones, of which the following is a specification.

This invention is an improvement on the machine shown in my application filed August 27, 1906, Serial Number 332,224.

The object of my present invention is to simplify and improve the mechanism shown in my former application; a further object of my invention is to provide a machine of this character wherein the bringing of the successive records into playing position does not materially increase the work on the motor and consequently I am enabled to use a motor, spring or electric, of the size that would ordinarily be used in a single record machine; and with these and minor objects in view my invention consists in the parts and combination of parts as will be herein- after more fully set out.

In the drawings—Figure 1 is a front elevation of a multiplex graphophone embodying my invention; Fig. 2 is a top plan view of the same; Fig. 3 is a side elevation; Fig. 4 is a detail elevation, parts being in section; Fig. 5 is a detail elevation of part of the carriage returning mechanism; Fig. 6 is a detail view of a slight modification of the magazine wheel; Fig. 7 is a detail view of a modification of part of the driving mechanism; Fig. 8 is a detail view of the carriage elevating pawl.

1 represents a suitable base upon which standards 2 are secured. A frame 3 is mounted upon the top of said standards and secured thereto by means of the bolts or screws 4. One of the side members of the frame is depressed at its center as at 5 which permits of the ready removal of a cylinder record from the magazine wheel. Suitable bearings 6 are hung from the frame 3 in which the magazine wheel 7 is journaled. The magazine wheel is of spider construction, the spokes on one side of the wheel having hinged members 8 which are

kept in locked position by means of the levers 9.

10 is the carriage rod and 11 the feed screw mounted in the frame 3 toward the rear of the machine.

12 is the return or repeating screw mounted near the front of the machine.

13 is a gear casing in which is journaled a suitable gear train.

14 is the band or power wheel connected by means of a shaft 15 to the gear train.

16 is the reproducing carriage having a suitable slide 17 mounted upon the rod 10.

18 are feed nuts adapted to engage the feed screw 11. These nuts are mounted upon spring rods or stems 19, which in turn are mounted upon the slide 17 and secured thereto by means of the screws 20.

21 is a rod or bar secured near the front of the machine adapted to support the front end of the reproducer carriage 16. This bar or rod is provided with an elongated slot 22 to be hereinafter referred to. The carriage 16 is provided at its front end with lugs 23 and 24 between which is pivoted an arm 25, said arm depending from the carriage and provided with a shoulder 26. This arm is provided with a pin 27 adapted to contact with the pin 28 in the lug 23, whereby the arm is prevented from falling back toward the center of the machine, thus insuring the arm at all times depending from the front of the carriage.

29 is a double cam mounted upon a carriage by means of the screw 30, said double cam being provided with operating pins 31 and 32. This double cam, when in the positions shown in Figs. 4 and 5, permits the front of the carriage to rest directly upon the bar or rod 21. If for any reason, such as transferring records, it is desirable to raise the front of the carriage, the double cam is swung upon its pivot whereby one of the cam faces is brought into engagement with the rod 21, thereby elevating the front of the carriage. If the carriage is raised without the aid of this cam the arm 25 has a tendency to swing inward until its shoulder 26 rests upon the top of the bar 21. When the cam 29 is used the pin 27 of the

arm is engaged by one of the cam faces, whereby it is prevented from engaging the rod 21.

33 is a tooth-bar depending from the front of the carriage and provided with the tooth 34, which is adapted to engage, under certain conditions, the return or repeating screw 12.

35 is an arm extending from one side of the front of the carriage over the bar 21, said arm being provided with an elongated slot 36.

37 is a flat hook secured upon the arm 35 by means of the set screw 38 which passes through the elongated slot 36. This hook is provided with lugs 39 between which is pivoted a stop 40. By means of the stop I am enabled to limit the movement of the carriage by reason of the fact that it is adjustably mounted through the medium of the flat hook 37 and the slot 36. The carriage is provided with a loosely hung pawl 41 having an elongated slot 42 in which a screw 43 is secured to limit the side movement of said pawl. The pawl in Fig. 8 is normally pressed from the carriage toward one side by means of the flat spring 44.

45 is a cam mounted upon the right hand end of a repeating or return screw 12. Any suitable means may be employed to lock said cam at any desired point on the screw 12 according to the length of the record to be reproduced.

In the operation of the machine the carriage is fed toward the right and as the end of the record is approached the pawl 41 contacts with the cam 45, but, by reason of the flat spring 44 and the slot 42, said pawl is adapted to give until the limit of compression of the spring 44 is reached, when, the friction between the two parts is sufficient to enable the pawl to climb the eccentric when the lowest point of the eccentric is reached, whereupon the energy stored up in spring 44 causes the pawl 41 to slide upon the periphery of the eccentric. By reason of this lateral movement of the pawl it is adapted to have a wide point of contact with the eccentric, whereby it is prevented from accidentally slipping off of the eccentric. As soon as the pawl is in engagement with the highest point of the eccentric or cam, the front of the carriage is elevated and the arm 25 permitted, by gravity, to fall against the bar 21, whereupon the shoulder 26 rests upon the top of the bar 21. In this position of the carriage the feeding nuts 18 are disengaged from the feed screw 11 and the tooth 34 is in engagement with the repeat or return bar 12. The machine continuing to run in the forward direction, the carriage is returned to its initial posi-

tion by the screw 12 and when approaching the starting point the arm 25 is forced outward by contact with the trip 46 set at an angle to the bar 21, until the shoulder 26 is pulled from the top of the bar 21, whereupon the carriage is free to descend in contact with its feed screw for repeating a record or reproducing a new record. This trip 46 is adjustably secured in the elongated slot 22 of the bar 21 whereby the depression of the carriage may be varied.

I have found that heretofore the carriages upon being dropped into engagement with the feed screw at the initial starting point, have frequently damaged or broken the records, therefore, it is my intention to use the buffer 48^a at this point, said buffer being connected to a suitable piston 47 mounted in the cylinder 48, said piston having a ball valve 49.

50 is the shaft of the magazine wheel upon which is mounted a bevel gear 51, which is adapted to be engaged by a bevel gear 52 keyed to the shaft 53. On the end of the shaft 53 is a ratchet wheel 54.

55 is a dog suitably mounted on the frame of the machine.

56 is a pin to limit the upward movement of the dog 55.

57 is an arm loosely hung from the shaft 53. There are two of these arms, one on each side of the ratchet wheel 54.

58 is a pawl having a counterweight 59, said pawl being pivotally mounted between the arms 57 in position for engagement with the ratchet wheel 54.

60 is a link pivoted to the arms 57 and to the lower end of a lever 61, said lever being provided with a handle 62 near its upper end. This lever is pivoted at 63 and is provided at its upper end with a slot 64 through which the arm 35 of the carriage passes in the forward movement of the carriage.

65 is a plate secured to the top of the frame and provided with an elongated slot through which the lever 61 extends.

66 is a plate secured upon the plate 65 and provided with forked ends 67, which register with each side of the elongated slot in the plate 65.

68 is a bell-crank lever pivoted at 69 to the top of the frame 3, one end of which extends between the plates 65 and 66, as clearly shown in Figs. 1 and 2, and is adapted to contact with the lever 61.

70 and 71 are two forked end plates superimposed, the forked ends of which are spaced apart in order that the other arm of the bell crank lever 68 may freely move between them.

72 is a bracket upon which a lever 73 is pivoted, the upper end of said lever being

positioned in the forked ends of the plates 70 and 71 and adapted for engagement with one arm of the bell crank lever 68.

74 is a shaft journaled at the front of the machine, to which are keyed the arms 75, the lower ends of which are notched as at 76 for engagement with the outer ends 77 of the arms 7 of the wheel (magazine wheel).

78 is a coiled spring positioned around the shaft 74, one end of which is attached to the stud 79 on the frame of the machine and the other end to one of the arms 75, whereby the normal position of the arm 75 is in engagement with the ends 77 of the wheel-arm. The lower end of lever 73 is forked and adapted for engagement with one of the arms 75.

When the carriage is at the initial position on the record the lever 61 is in the position shown in Fig. 1. As the carriage is fed along the record the hook 37 and the arm 35 pass through the slot 64 in the upper end of the lever 61, until the pawl 41 engages the periphery of the cam or eccentric 45, whereupon the front of the carriage is elevated by said cam and the arm and hook raised to a point above the slot 64 in the arm 61. The tooth 34 is now in engagement with the return screw 12 and as the carriage is fed in the return direction the hook 37 engages the upper end of the lever 61 and pulls it toward the left hand side of the machine. As the carriage is moving toward the right hand side of the machine and the hook 37 has passed through the slot in the upper end of the lever 61, the arm 40 engages the lever above the slot 64 and forces said lever toward the right of the machine thus drawing, through the link 60, the pawl 58 into engagement with another tooth on the ratchet wheel 54. The lever is now practically in a perpendicular position. As the lever is being pushed to the perpendicular position it engages the bell crank lever 68, thereby operating the lever 73 and forcing the arms 75 out of engagement with the magazine wheel. As the machine is being returned to its initial position by means of the screw 12, the arm 40 moves the lever toward the left of the machine a slight distance and the hook 37 following engages the lever above the slot 64 and forces it toward the left of the machine until the arc of the movement of the lever is below the hook whereupon the hook is free to move toward the left of the machine without further engagement with the lever. The lever in being forced toward the left of the machine revolves the shaft 53 one tooth of the ratchet wheel 54, by means of the weighted pawl 58. This movement, through the bevel gear wheels 51 and 52 revolves the magazine

wheel a sufficient distance to bring the next succeeding record in position under the stylus of the reproducer, whereupon the arms 75, under tension of the spring 78, snap into engagement with the outer ends of the arms of the wheel, thus holding the wheel against revolution while the record is being reproduced. During a certain period of the movement of the lever 61 the arms 75 are out of engagement with the magazine wheel, but the reverse movement of the wheel is prevented by reason of the dog 55 engaging the ratchet wheel 54.

80 is a sprocket wheel mounted upon the shaft 50.

81 is a frame mounted upon the top of the frame 3 at the rear, in which is journaled a shaft 82 upon which is keyed an indicator 84, on which are successive numbers which appear through the opening 85 in the hood 86.

87 is a sprocket wheel journaled on the shaft 82, said sprocket wheel being connected to the sprocket wheel 80 by means of the sprocket chain 88.

As the lever 61 is forced toward the left of the machine and the shaft 50 revolved and a succeeding record brought into playing position the sprocket wheel 80 is revolved, which, by means of the chain 88, revolves the sprocket wheel 87, whereupon the shaft 82 and the indicator 84 are simultaneously revolved with the magazine wheel and the number of the record being reproduced is indicated through the opening 85 in the hood 86.

As soon as the twelve records are played or reproduced and it is desired to reload the machine the lock is removed from the hinged end of the arm of the wheel, said hinged arm being thrown down into the depression or yoke 5 in one of the sides of the frame 3, whereupon the record may be removed from the cylinder immediately opposite said yoke or depression. The successive cylinders are moved into this position until the wheel is reloaded with new records.

While I have shown the magazine wheel adapted for twelve records it will, of course, be understood that in practice I may make it to hold three, six, nine or twelve records, more or less.

The shaft 89 having the knob 90 or handle is adapted for connection with the motor (not shown), whereby the motor may be started or stopped.

It is my intention to have an ornamental wooden case around the machine extending up to the frame 3.

In Fig. 6 I have shown a slight modification of the construction of the magazine wheel, by means of which I am enabled to dispense with the spokes on one side of the

wheel. In order to do this, I increase the bearing in the end of the spokes of the wheel so as to give an increased bearing to the shaft upon which the cylinders 91 are mounted. Naturally the size of the shaft on which the cylinder is mounted would be increased in this construction inasmuch as the outer end of the shaft will not have a support.

10 In Fig. 7 I have shown a worm as a substitute for the shaft 53. In cases where I elect to use the worm in place of the shaft 53, I will omit the dog 55 inasmuch as the worm will be sufficient to prevent a backward movement of the magazine wheel.

15 In the event that it is not desired to repeat a record the arm 40 is thrown back from the position shown in Fig. 2, but in all cases when it is desired to repeat the same record the arm is thrown into the position shown in Fig. 2.

The object of mounting the nuts 18 on the spring arms 19 is to protect the thread on the rod 11. For instance, in the event that the carriage is let down at the beginning of a record in such position that the thread in the nuts does not exactly register with the thread on the rod 11, the nut may, by resiliency of the arm, give and automatically adjust itself to said thread, besides which slight wear in the thread of the nuts and the rod is taken up by the resiliency of these arms.

25 The trip 46 determining the depression of the carriage after its return to the beginning of a record and the hook 37 determining the automatic return of the carriage being mounted in elongated slots are adjustable to accommodate records of different lengths.

I am aware that slight changes may be made in the details of construction without departing from the spirit of my invention, and hence, I would have it understood that I do not wish to be limited to the details shown.

What I claim and desire to secure by Letters Patent is:

1. In a sound reproducing machine, the combination with the carriage, of means to elevate the carriage at the end of its forward movement, means to return it to its initial position, means to lower the carriage and cushioning means resisting the sudden descent of the carriage from its elevated position.

2. The combination with a graphophone of a carriage, one end of which is free to be raised, a rod supporting said free end, of means cushioning the descent of the carriage to its supporting rod.

3. The combination with a graphophone

having a carriage one end of which is free to be elevated, and a rod to support the free end, of cushioning means to gradually lower the carriage from its elevated position to its position on its supporting rod.

4. The combination with a graphophone, having a carriage one end of which is free to be elevated, and a rod for supporting the free end of the carriage in its normal position, of an air chamber, a piston therein, and means connected with said piston and interposed in the path of the carriage as it is lowered from an elevated position to absorb the shock incident to the descent of the carriage.

5. The combination with a graphophone having a carriage, one end of which is free to be elevated, and a rod for supporting said free end, of a lever interposed in the path of the carriage as it is lowered to its supporting rod, and a cushioning medium controlling the movement of said lever.

6. The combination with a graphophone having a carriage, one end of which is free to be elevated, and a rod for supporting said free end, of an air chamber, a piston in said chamber, a lever connected with said piston at one end, while its other end is interposed in the path of the carriage as it is lowered from an elevated position to its supporting rod, whereby all shock incident to the descent of the carriage is absorbed.

7. The combination with a graphophone having a carriage, one end of which is free to be elevated, and a rod for supporting said free end, of a lever pivoted to said rod, one end of which is deflected into the path of the carriage, an air chamber, a piston in said chamber with which the other end of the lever is attached.

8. The combination with a graphophone, having a carriage, one end of which is free to be elevated, and a rod for supporting said free end, of a lever pivoted to said rod, one end of which is deflected into the path of the carriage, an air chamber, a link connecting the piston and the other end of said lever.

9. In a duplex graphophone, the combination with the carriage, of a supporting bar for the free end of the carriage having a slot near one end and an arm adjustably mounted in said slot.

10. In a sound reproducing machine, the combination with the carriage, of a supporting rod for the free end of the carriage, a slot in said rod and an arm adjustably secured in said slot at an angle less than a right angle to said rod.

11. In a sound reproducing machine, the combination with the carriage, of a supporting rod for the free end of the carriage pro-

vided with a slot, an arm pivotally mounted on and depending from the free end of the carriage, and adapted to rest upon the supporting rod, an arm adjustably mounted in the slot of the supporting rod and adapted to engage the arm depending from the carriage to disengage it from the supporting rod.

12. In a sound reproducing machine, the combination with the carriage, of a pawl loosely pivoted thereon and provided with an elongated slot, a stud on the carriage projecting into said slot, a spring tending to move the pawl away from the carriage and means engaged by the pawl to elevate the carriage at a predetermined point.

13. In a sound reproducing machine, the combination with the carriage, of a pawl loosely pivoted thereon, a spring tending to move the pawl from the carriage, a return screw, a cam mounted on said screw adapted to engage the pawl and gradually press it against the carriage, said pawl engaging the perimeter of the cam when its spring is fully compressed and thus elevate the carriage at a predetermined point.

14. In a duplex graphophone the combination with the carriage, and a magazine record carrying wheel, of an operating lever for revolving said wheel, an arm on said carriage adapted to engage the lever on the return movement of the carriage, a ratchet wheel mounted on a shaft geared to the shaft of the magazine wheel, a pawl pivoted to the frame of the machine and adapted to engage said ratchet wheel, and a link connecting the said pawl with the said lever.

15. In a duplex graphophone the combination with the carriage, and a magazine record carrying wheel, of an operating lever for revolving said wheel, an arm on said carriage adapted to engage the lever on the return movement of the carriage, a ratchet wheel mounted on a shaft geared to the shaft of the magazine wheel, a pawl pivoted to the frame of the machine, and adapted to engage said ratchet wheel, a yoke loosely mounted on the shaft of the ratchet wheel with its lower end pivoted to the said pawl and a link connecting said pawl and operating lever.

16. In a duplex graphophone the combination with the carriage, and a magazine record carrying wheel, of an operating lever for

revolving said wheel, an arm on said carriage adapted to engage the lever on the return movement of the carriage, a ratchet wheel mounted on a shaft geared to the shaft of the magazine wheel, a pawl pivoted to the frame of the machine, and adapted to engage said ratchet wheel, a yoke loosely mounted on the shaft of the ratchet wheel with its lower end pivoted to the said pawl, a link connecting said pawl and operating lever, and a dog engaging the ratchet wheel holding it against reverse movement.

17. In a duplex graphophone the combination with a magazine record wheel of a carriage, a lever operated by the return movement of the carriage, means holding the wheel against revolution, and means operated by said lever for releasing the wheel for revolution.

18. In a duplex graphophone the combination with a magazine record wheel, of a carriage, means holding the wheel against revolution, a lever operated by the return movement of the carriage a bell crank lever operated by said first named lever and means operated by the bell crank lever to release the wheel for revolution.

19. In a duplex graphophone the combination with a carriage and magazine record wheel, of an arm secured to the machine adapted to engage said wheel, and hold it against revolution, an operating lever operated by the return movement of the carriage, a bell crank lever, operated by the operating lever, said arm being operated by the bell crank lever to release the magazine wheel for revolution.

20. In a duplex graphophone the combination with a carriage, a magazine record wheel and means for revolving the wheel of an arm secured to the carriage and provided with an elongated slot, a slide adjustably mounted in said slot, and a stop arm hinged on said slide whereby it may be thrown back to prevent engagement with the means for revolving the magazine wheel when it is desired to repeat a record.

In testimony whereof I affix my signature in presence of two witnesses.

HYMAN E. MARKLE.

Witnesses:

ROBT. J. LEUTZ,
JOSEPH SIMON.

L. J. GERSON.
SOUND REPRODUCING MACHINE.
APPLICATION FILED NOV. 20, 1908.

962,565.

Patented June 28, 1910.

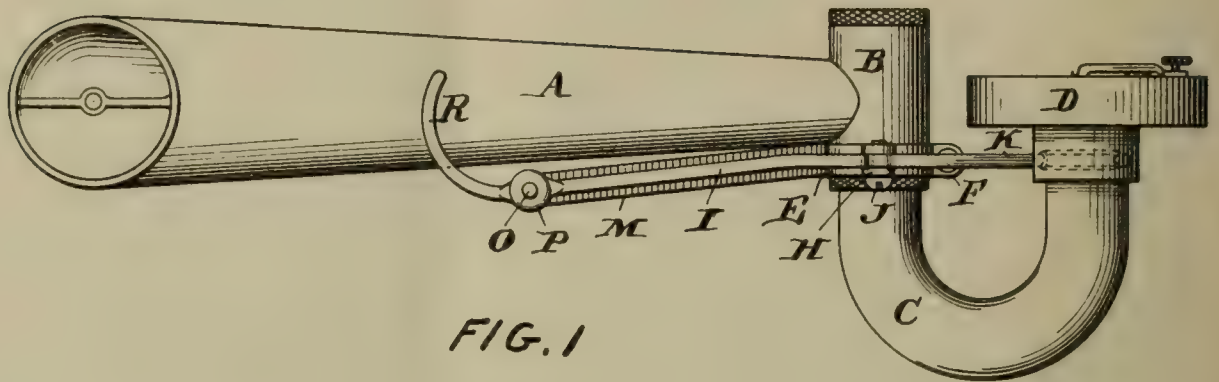


FIG. 1

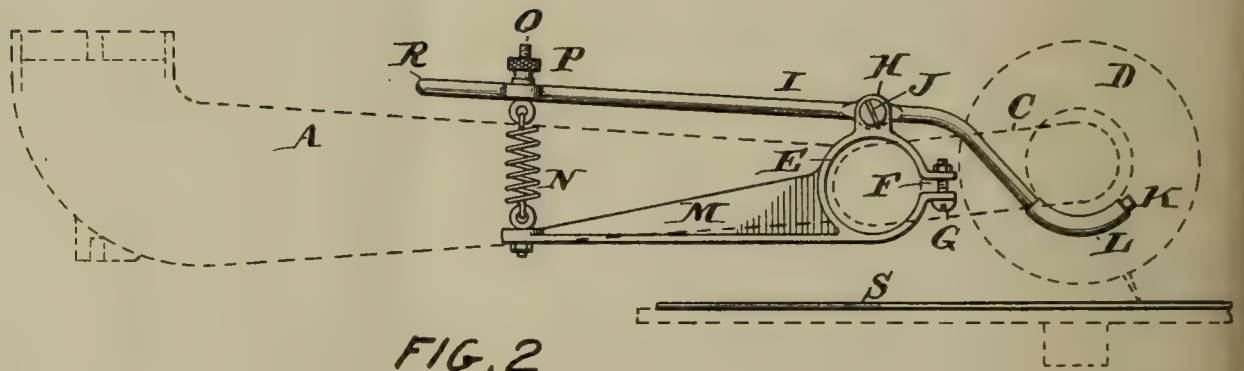


FIG. 2

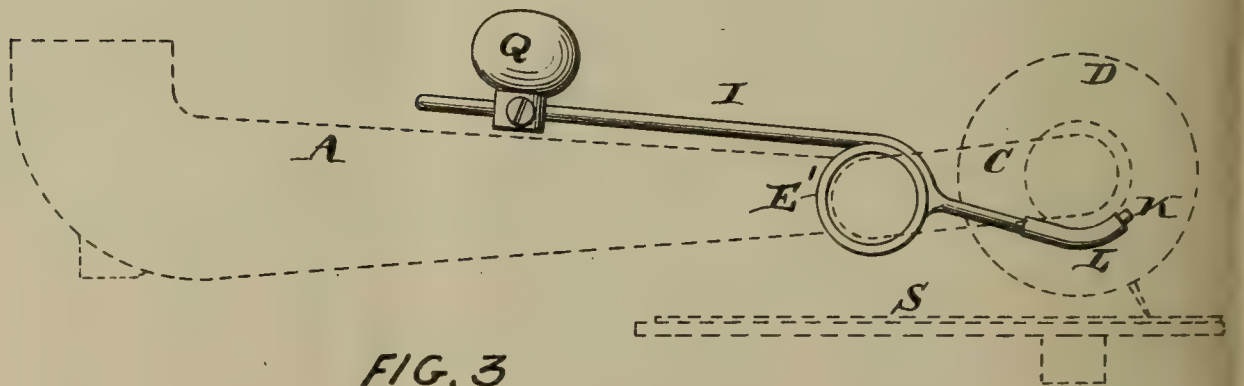


FIG. 3

Witnesses

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UNITED STATES PATENT OFFICE.

LOUIS JAY GERSON, OF PHILADELPHIA, PENNSYLVANIA.

SOUND-REPRODUCING MACHINE.

962,565.

Specification of Letters Patent. Patented June 28, 1910.

Application filed November 20, 1908. Serial No. 463,718.

To all whom it may concern:

Be it known that I, LOUIS JAY GERSON, a citizen of the United States, and a resident of the city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in Sound-Reproducing Machines, of which the following is a specification.

My invention has reference to sound reproducing machines and consists of certain improvements which are fully set forth in the following specifications and shown in the accompanying drawings which form a part thereto.

In many types of sound reproducing machines in which a floating reproducer is employed in connection with a disk having a laterally undulating sound record, there is great wear upon the record groove by the stylus point tracking the groove, because of the excessive weight exerted upon the record groove by the sound box and its supporting means.

The object of my invention is to provide a sound reproducing machine with a counterbalancing device for the sound box and the tubular arm supporting it, whereby the weight of said parts and each of them, may be counterbalanced to the extent desired to reduce the pressure and consequent wear upon the record disk, with the result that the life of the record is increased and much of the scratching sounds at present reproduced are largely eliminated.

My invention consists of the tubular arm, such as employed in disk talking machines, provided at its free end with a sound box having capacity for vertical movement or adjustment, combined with a counterbalancing device carried by the tubular arm and counterbalancing the weight of the sound box, whereby the pressure of the stylus upon the record disk of the machine may be varied.

My invention further consists in providing a pivoted tubular arm with a hinged tubular part terminating in a sound box, and combined with a lever device hinged to the pivoted tubular arm and having one end extended forward to support the sound box and the other extending rearward and provided with means for counterbalancing some of the weight of the sound box.

My invention also comprehends details of construction which, together with the features above specified, will be better under-

stood by reference to the drawings, in which:

Figure 1, is a plan view of a tubular arm and sound box of a talking machine having my improvements applied thereto; Fig. 2, is a side elevation of the counterbalancing devices embodying my improvements and with the tubular arm, sound box and record disk indicated in dotted lines; and Fig. 3, is a similar view to that shown in Fig. 2, illustrating modification of my invention.

A is a tubular arm, such as employed in a disk talking machine in commercial use, and is usually supported so as to swing laterally over the record S. The end of this tubular arm A is provided with a transverse tubular bearing B. Journaled in this bearing is a goose neck formed of the tubular part C and carrying at its free end the sound box or reproducer D, having a stylus or needle which tracks the groove in the record S. This construction is such that the bearing B remains normally at a fixed distance above the record S, whereas the sound box is free to swing vertically as desired, being held and guided by the goose neck C which is journaled in the part B of the arm A. My invention is very easily adapted to this character of sound box supporting arm and as shown, it comprises the following counterbalancing devices. A collar E fits over one of the lateral ends of the tubular bearing B, and has flanges F through which the clamping screw G extends, and by which the collar E is rigidly clamped in fixed position upon the part B of the said arm A. The upper part of this collar is provided with a flange H carrying a pivot pin J upon which is pivoted the counterbalancing lever I. The forward end K of this lever I is extended downward and under the hub portion at the back of the sound box D, and to prevent rattling, said end K may be covered with a piece of rubber tubing L to form a cushion structure. The collar E is also provided with a rearwardly extending bracket M to which a counterbalancing spring N is secured. The other end of the spring is attached to an adjusting screw O which extends upward through the lever I, and is provided with a nut P. By turning the nut P, any desired tension may be put upon the spring to counterbalance, to a greater or less extent, the weight of the sound box D and tubular goose neck C. The rear end of the

lever I may be bent laterally as at R so as to strike the upper part of the arm A and act as a stop whenever the sound box is turned upward or backward, as for instance,

15 when applying a new needle or stylus point. By having the collar E adjustably clamped upon the bearing B, it is evident that the counterbalancing device as a whole may be adjusted in any suitable position to
20 suit the requirements of the apparatus.

When the collar E is properly clamped by the screw G, it becomes rigidly attached to the part B of the arm A, but with capacity for proper adjustment of the counterbalancing attachment. I am enabled to reduce the friction between the stylus point and the groove of the record disk S to a minimum and with a proper co-action for reproducing sound and feeding the sound box. By
25 attaching the counterbalancing device to the part B, all strain upon the journal bearing of the goose neck C is removed, and consequently the counterbalancing device is sensitive and does not interpose objectionable strains.

My invention may be employed in connection with various types of disk record sound reproducing machines and yet in all cases there will be a hinged arm or element carrying the sound box whereby it may be
30 raised or lowered with respect to the sound record disk, combined with a counterbalancing means independent of said arm or element and sound box for counterbalancing them and yet permitting them to be raised independent of the counterbalancing devices.

It will be observed that, in the general constructions shown, the arm structure supporting the sound box may be considered as composed of two tubular parts, one having a
40 relatively fixed distance from the record disk, and the other pivoted to said part in such manner as to enable the sound box to be raised and lowered with respect to the disk, combined with a counterbalancing device having a connection with that portion
45 of the tubular support which is maintained at the relatively fixed elevation from the record disk and adapted to counterbalance the sound box while, permitting it to be freely
50 raised, preferably independently of the counterbalancing device, when so desired.

I have shown the construction of my invention in the form which is excellently adapted for commercial use, but I do not
55 limit myself to the details as these may be modified without departing from the spirit of the invention.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a sound reproducing machine, the combination of a tubular arm, a sound box, a hinged tubular part on the end of the tubular arm to support the sound box whereby
65 it may be raised or lowered, and a counter-

balancing device for counterbalancing the sound box and free end of the hinged tubular part consisting of a lever pivoted in vertical alinement with the axis of the hinged tubular part and having one end arranged
70 for supporting the sound box and tubular part and the other end bent laterally over the tubular arm to act as a stop, and a counterbalancing means operating upon the other end of the lever. 75

2. In a sound reproducing machine, the combination of a tubular arm, a sound box, a hinged tubular part to support the sound box hinged to the tubular part whereby it may be raised or lowered, and an independent counterbalancing device for counterbalancing the sound box and free end of the hinged tubular part and from which the said parts are vertically adjustable, said counterbalancing device consisting of a lever
80 pivoted axially with the hinge of the tubular part and having one end arranged for supporting the sound box and tubular part, and a counterbalancing means operating upon the other end of the lever. 85 90

3. In a sound reproducing machine, the combination of a tubular arm having a transverse tubular end, a tubular goose neck hinged to the tubular end of the tubular arm, a sound box secured to the free end of the
95 tubular goose neck, and counterbalancing devices carried by the tubular arm and operating to support the sound box and goose neck against the action of gravity consisting of a counterbalancing lever adjustably
100 hinged to the transverse tubular end of the tubular arm and having a connection with the sound box and goose neck the construction being such that it is adjustable circumferentially about the axis of the hinge of the
105 goose neck.

4. In a sound reproducing machine, the combination of a tubular arm, a tubular goose neck hinged to the end of the tubular arm on a transverse axis, a sound box secured to the free end of the tubular goose neck, a counterbalancing lever hinged in substantial vertical alinement with the axis of the hinge of the goose neck and operating to support the sound box and goose neck
115 against the action of gravity, a collar clamped to the tubular arm so as to be adjusted circumferentially about the axis of the hinge of the goose neck and supporting the counterbalancing lever, and means acting upon the other end of the lever for counteracting the weight of the sound box and goose neck the construction being such that the hinge of the lever, the counterbalance means and the contact with the goose
120 neck are all in the same plane. 125

5. In a sound reproducing machine, the combination of a disk, a tubular sound conveying part having a relatively fixed distance above the disk, a second tubular sound
130

conveying part hinged to the first mentioned tubular part, a sound box secured to the free end of the second tubular part, and a counterbalancing device carried by the first mentioned tubular sound conveying part and acting to counterbalance the weight of the second tubular part and its sound box consisting of a lever hinged in vertical alinement with the hinge joint of the second tubular part and having one end arranged to support the sound box and said second tubular part, and counterbalancing means consisting of a spring and devices to adjust its tension carried on the first mentioned tubular part to operate the lever.

6. In a sound reproducing machine, the combination of a disk, a tubular sound conveying part having a relatively fixed distance above the disk and having a transverse tubular end, a second tubular sound conveying part hinged to the first mentioned tubular part on its transverse tubular end, a

sound box secured to the free end of the second tubular part, and a counterbalancing device carried by the first mentioned tubular sound conveying part and acting to counterbalance the weight of the second tubular part and its sound box consisting of a collar clamped in position upon the transverse tubular end of sound conveyer part and having a bracket, a counterbalancing lever hinged to the collar in vertical alinement with the axis of the hinged tubular part, a spring connecting the lever with the bracket, and means for adjusting the tension of the spring.

In testimony of which invention, I have hereunto set my hand.

LOUIS JAY GERSON.

Witnesses:

R. M. HUNTER,
AUGUST W. RETTIG.

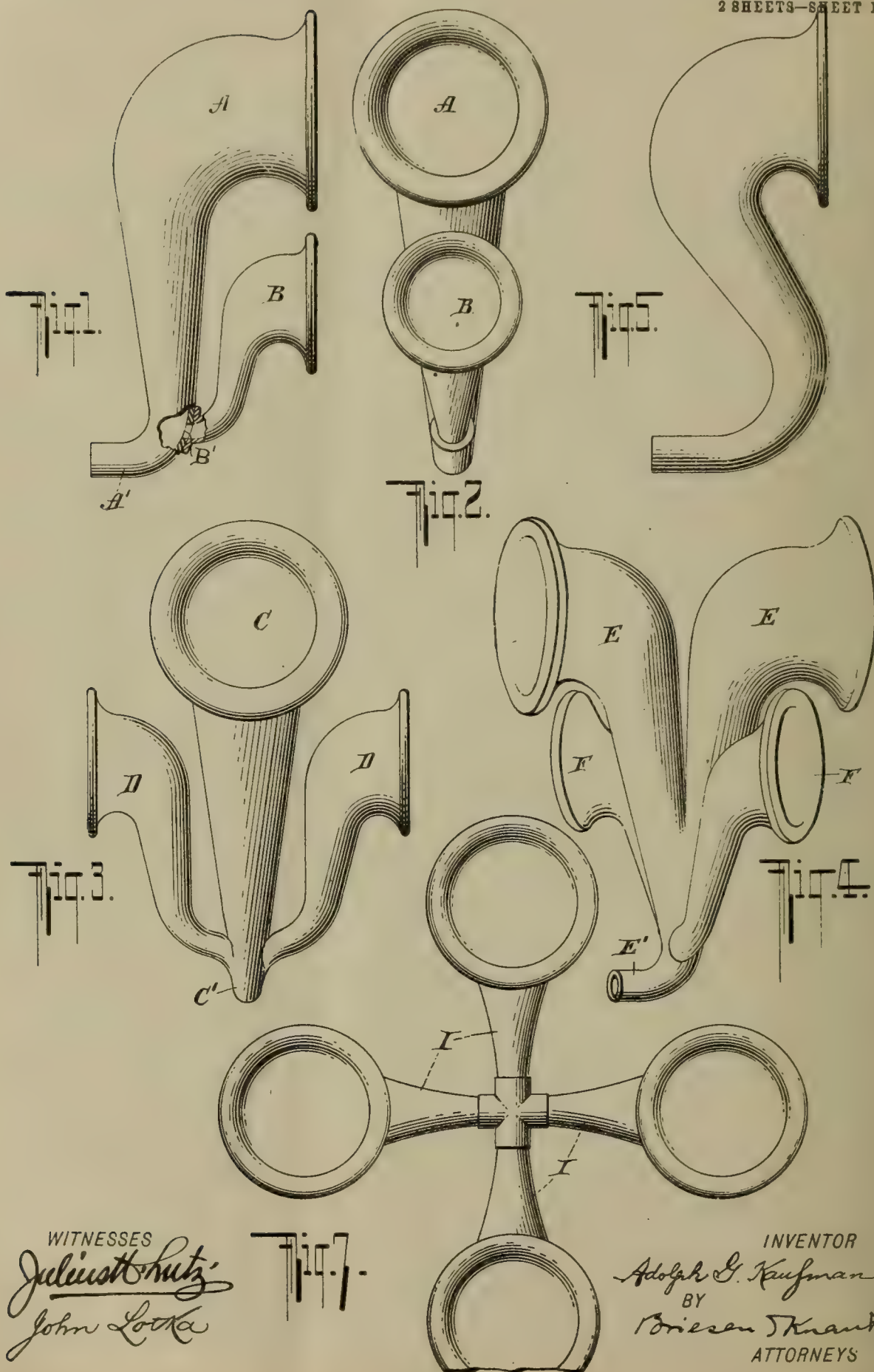


A. G. KAUFMAN.
SOUND HORN.
APPLICATION FILED FEB. 26, 1907.

962,574.

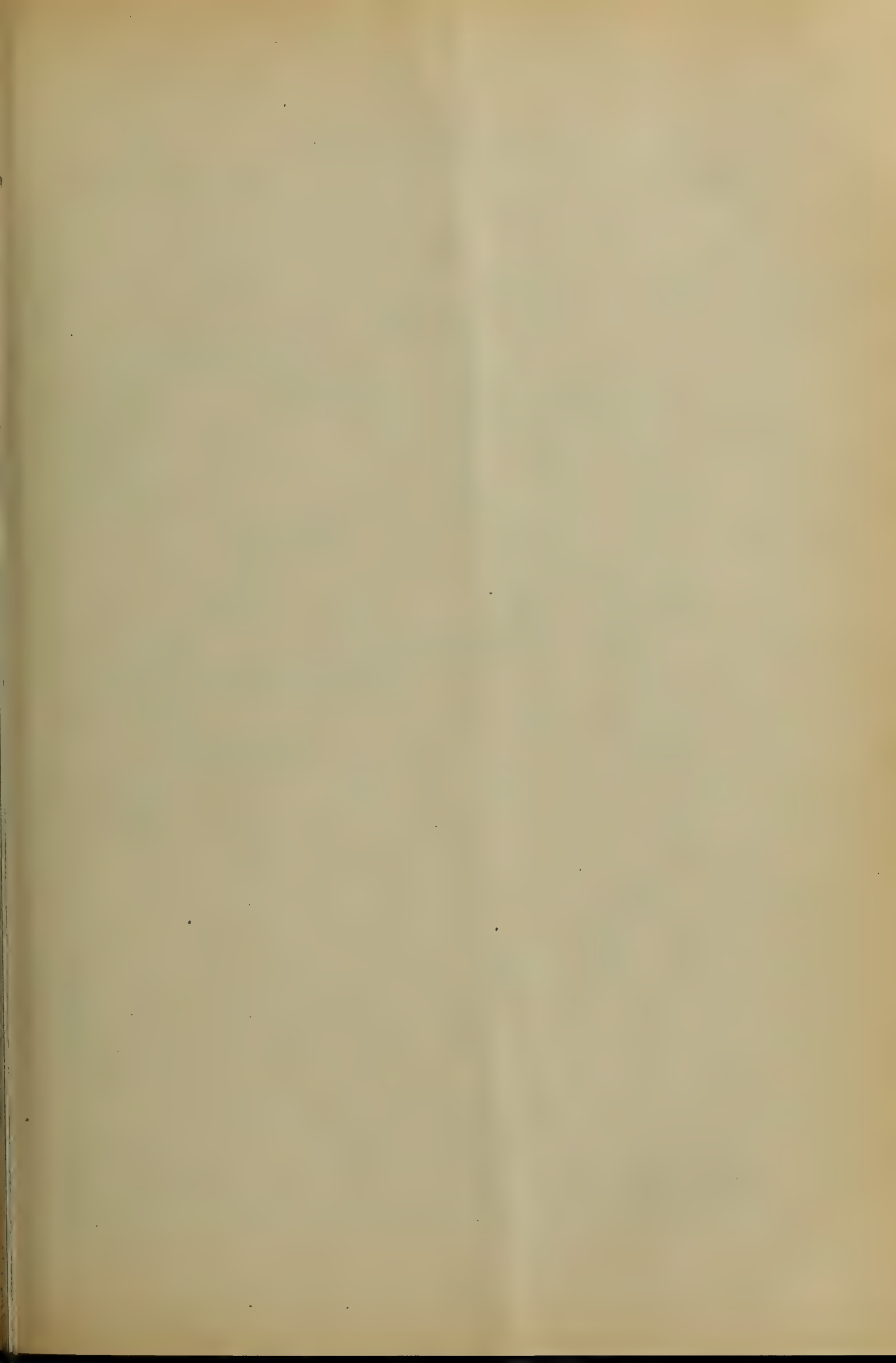
Patented June 28, 1910.

2 SHEETS—SHEET 1.



WITNESSES
Julius Hutz
John Loeke

INVENTOR
Adolph S. Kaufman
BY
Briesen Knauth
ATTORNEYS

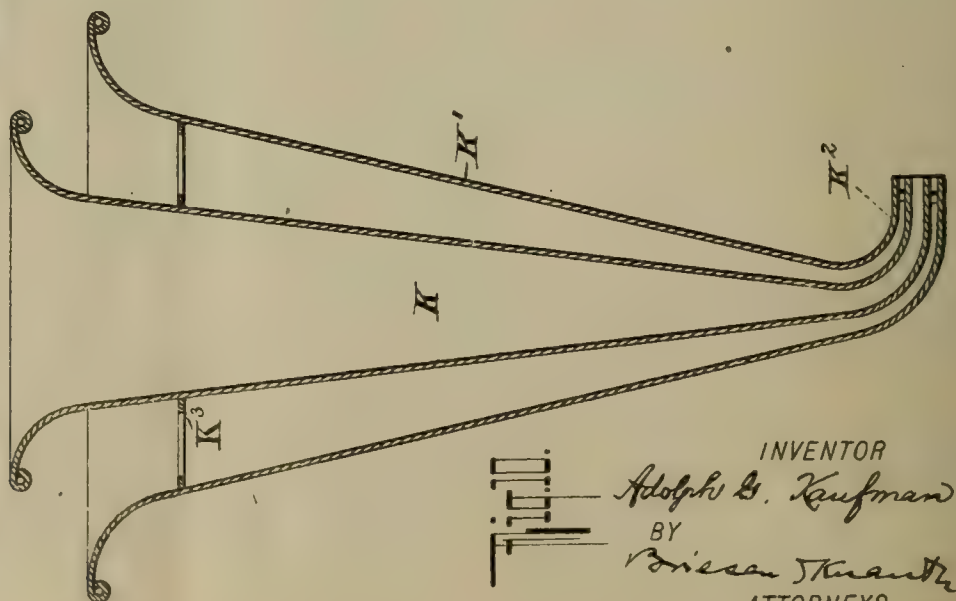
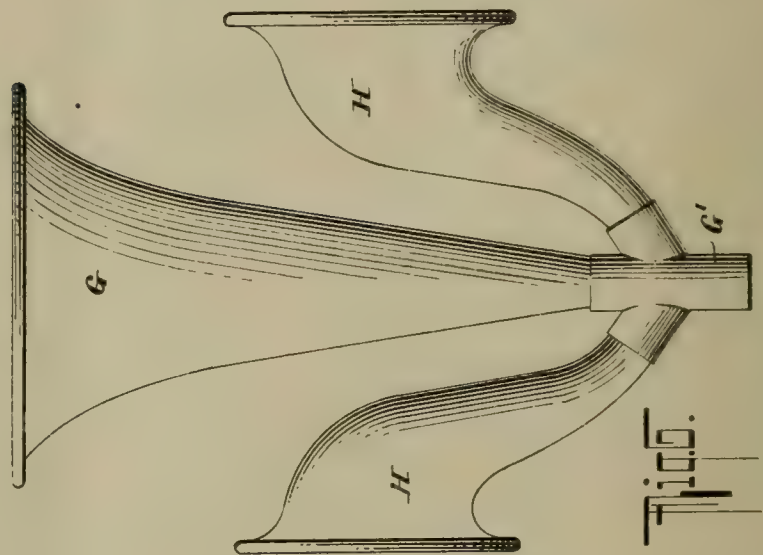
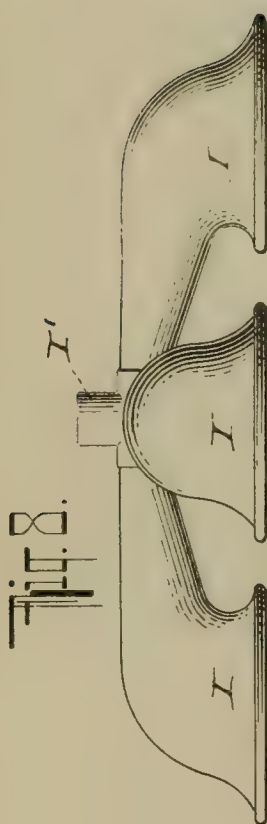
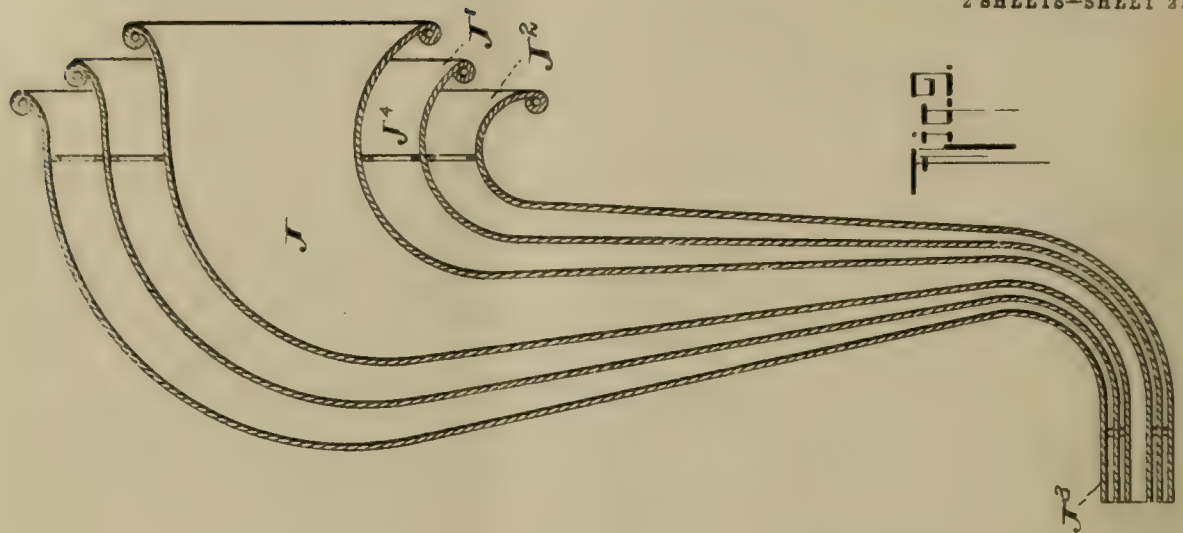


A. G. KAUFMAN.
SOUND HORN.
APPLICATION FILED FEB. 26, 1907.

962,574.

Patented June 28, 1910.

2 SHEETS—SHEET 2.



WITNESSES
Julius Hutz
John Loeke

INVENTOR
Adolph G. Kaufman
BY
Wissen & Knauff
ATTORNEYS

UNITED STATES PATENT OFFICE.

ADOLPH G. KAUFMAN, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN CALLAPHONE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF GEORGIA.

SOUND-HORN.

962,574.

Specification of Letters Patent. Patented June 28, 1910.

Application filed February 26, 1907. Serial No. 359,470.

To all whom it may concern:

Be it known that I, ADOLPH G. KAUFMAN, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Sound-Horns, of which the following is a specification.

My invention relates to horns for amplifying, purifying and distributing sounds and is applicable to apparatus of various kinds for producing or reproducing sounds, such as musical instruments, telephone receivers, talking machines, the telharmonium, and the horn is also capable of use directly as a megaphone. The device is also capable of use for the reverse function, that is, to collect and receive sounds.

Reference is to be had to the accompanying drawings in which I have shown various forms of sound horns, embodying my present invention.

Figure 1 is a side elevation, showing a double horn, Fig. 2 is a front elevation thereof; Fig. 3 is a front elevation of a triple horn; Fig. 4 is an elevation of a quadruple horn; Fig. 5 is a separate view of one of the horns, the same being given a peculiar S-shape, so as to occupy less space; Fig. 6 is a front view of a triple horn, differing from that shown in Fig. 3; Fig. 7 is a bottom view of another type of quadruple horn, and Fig. 8 is a side view of the horn shown in Fig. 7; Fig. 9 shows a nested triple horn, and Fig. 10 shows a nested double horn.

It has been found in practice that a horn of a given size and shape will respond better to certain notes than to others and will therefore emit such notes more loudly. Speaking in a general way, a small horn is better adapted for high notes and a big horn for low notes. When it is desired to use the same horn for high notes and low notes, it is often found that the result obtained is not satisfactory at all, and to remedy this the employment of several horns of different sizes, located at different places, has sometimes been resorted to, as in the telharmonium. With my present invention a single sound-producing source will be found sufficient, whether the notes be high or low. I accomplish this result by combining two or more horns, preferably of different capacities or qualities in such a manner that they

will receive the sound from the same source. The larger horn will give the proper volume to the low notes, while the smaller horn, or horns, will insure the proper value to the high notes.

In Figs. 1 and 2 the larger horn A and the small horn B are so arranged that their mouths or outlets extend substantially parallel to the receiving end A', the larger horn terminating above the small one. The connection between the small horn and the larger horn is made through an opening B' in the side of the larger horn. Each of the horns is tapering and curved and the outlets are located at a higher level than the receiving end A', although I do not wish to restrict myself to such an arrangement. The receiving end A' is either simply held against the mouth of the speaker, when the device is used as a megaphone, or connected with the proper part of a telephone receiver, talking machine reproducer, or other instrument.

In Fig. 3 I have illustrated a triple horn with a large horn C facing forwardly and two small horns D directed to the sides. The inlet connection C' is directed downwardly.

In Fig. 4 there are two large horns E, facing in opposite directions, and two small horns F, also facing in opposite directions, but at right angles to the horns E, E and preferably at a different (lower) level. Each of the small horns F connects with the sound conduit of the larger horns. There is a single sound receiving connection E' from which the sound reaches all the horns. The form of each individual horn may be varied and in some cases where it is desired to avoid too great a projection of the horn from the wall or instrument, the particular S-shaped form, shown in Fig. 5, may be adopted for the individual horns, or some of them.

The triple horn shown in Fig. 6 differs from that illustrated in Fig. 3 chiefly by the fact that the central horn G is directed upward instead of forward, the lateral horns H being of substantially the same arrangement and connected with the sound conduit of the larger horn G at a point slightly above the inlet connection G'.

In Figs. 7 and 8 I have illustrated a quadruple horn with individual curved and tapering horns I, directed downwardly and each connected with a common central re-

ceiving connection I' , which faces upwardly. The individual horns may be alike, as shown, or of different sizes.

5 In the forms of construction hereinbefore described each of the individual members of the multiple horn is entirely outside the other elements of the horn.

10 In Figs. 9 and 10 I have illustrated two forms of nested horns, where one element is within another. Fig. 9 shows three horn elements, J , J' , J^2 , nested one within the other, and all receiving the sound at the end J^2 and discharging it forwardly, each horn corresponding in shape substantially
15 to the horn A in Fig. 1. In Fig. 10 the horn has two members K , K' , one within the other, and provided with a receiving end or connection K^2 , which is horizontally disposed, while the other ends of the horn are
20 shown facing upward. Braces or distance pieces, J^4 , K^3 , may be employed in these two constructions and the inner horns may project beyond the outer horns at the outlet, although this is not absolutely necessary.

25 Actual trial has shown that the provision of two or more horns preferably of different qualities or sizes in connection with a single receiving connection or end common to

them, improves the results considerably, as regards the even reproduction and spreading 30 of sounds of different pitch.

It will be observed that in each of the constructions shown, the sound-receiving connection, that is, the tubular portion adapted to fit the phonograph, telephone or other 35 instrument, is formed exclusively by the inner end of one of the horns or horn elements. In other words, the sound-receiving connection is equal in diameter to the inner end of one of the horns. The inner ends of 40 all the horns are adjacent to each other and by nesting the horns as in Figs. 9 and 10, I am enabled to place their inner or narrow ends in the same plane.

I claim as my invention: 45

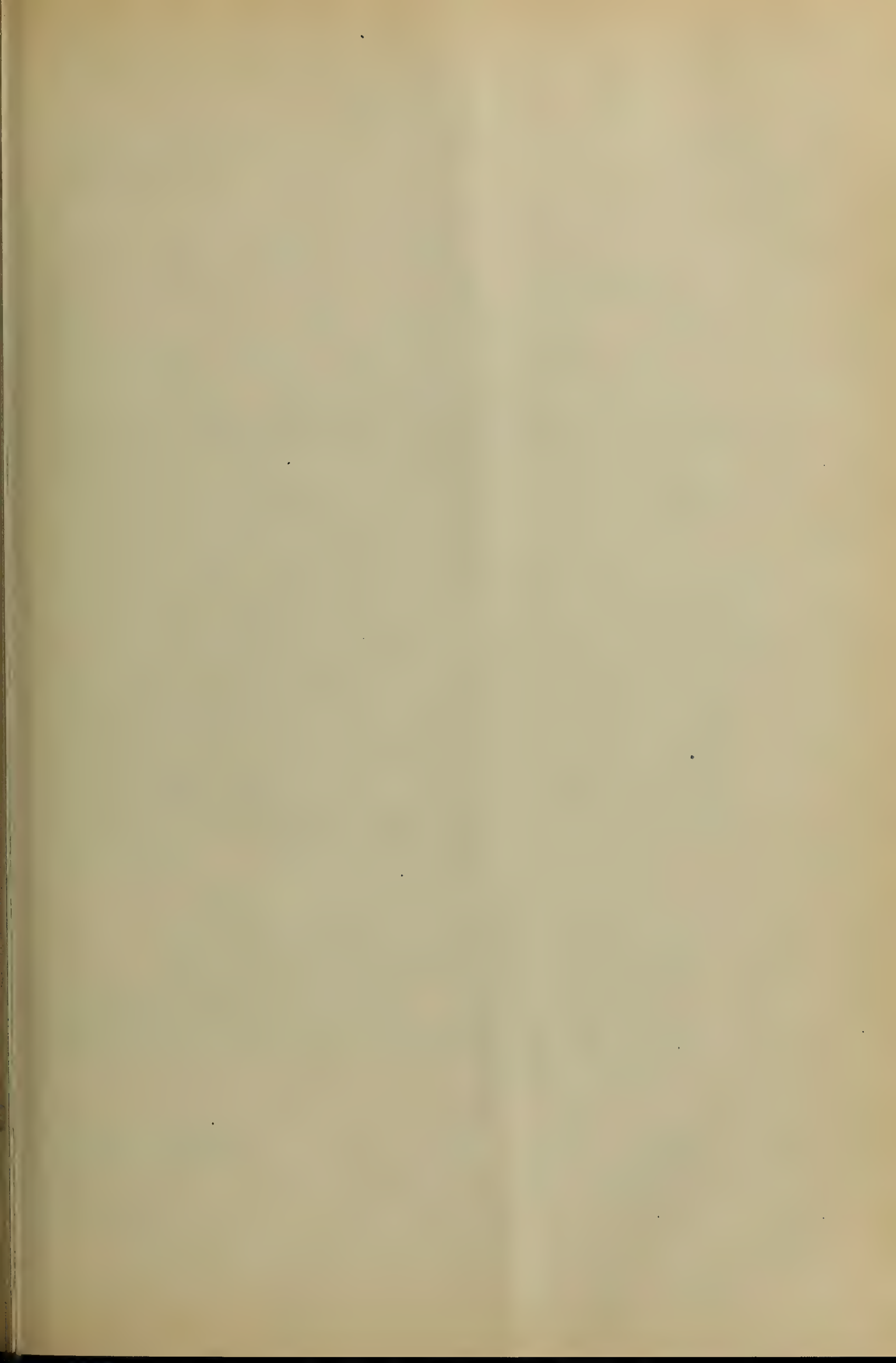
A sound horn comprising a plurality of nested tubular elements, the wide end of the inner element projecting forward of the element surrounding it.

In testimony whereof I have hereunto 50 signed my name in the presence of two subscribing witnesses.

ADOLPH G. KAUFMAN.

Witnesses:

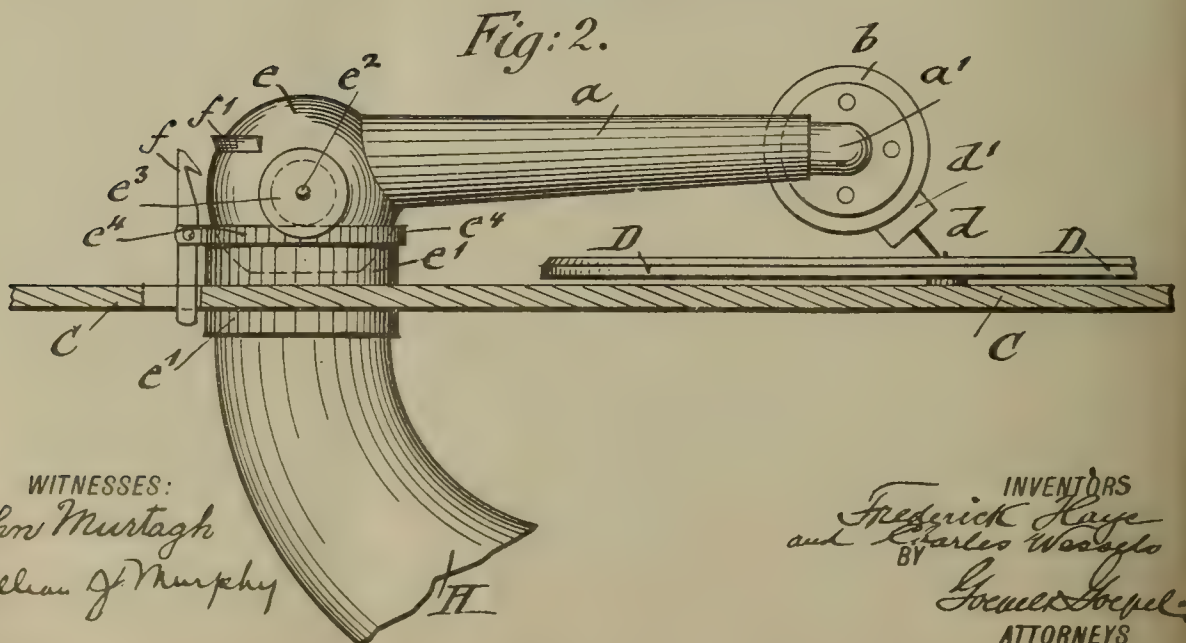
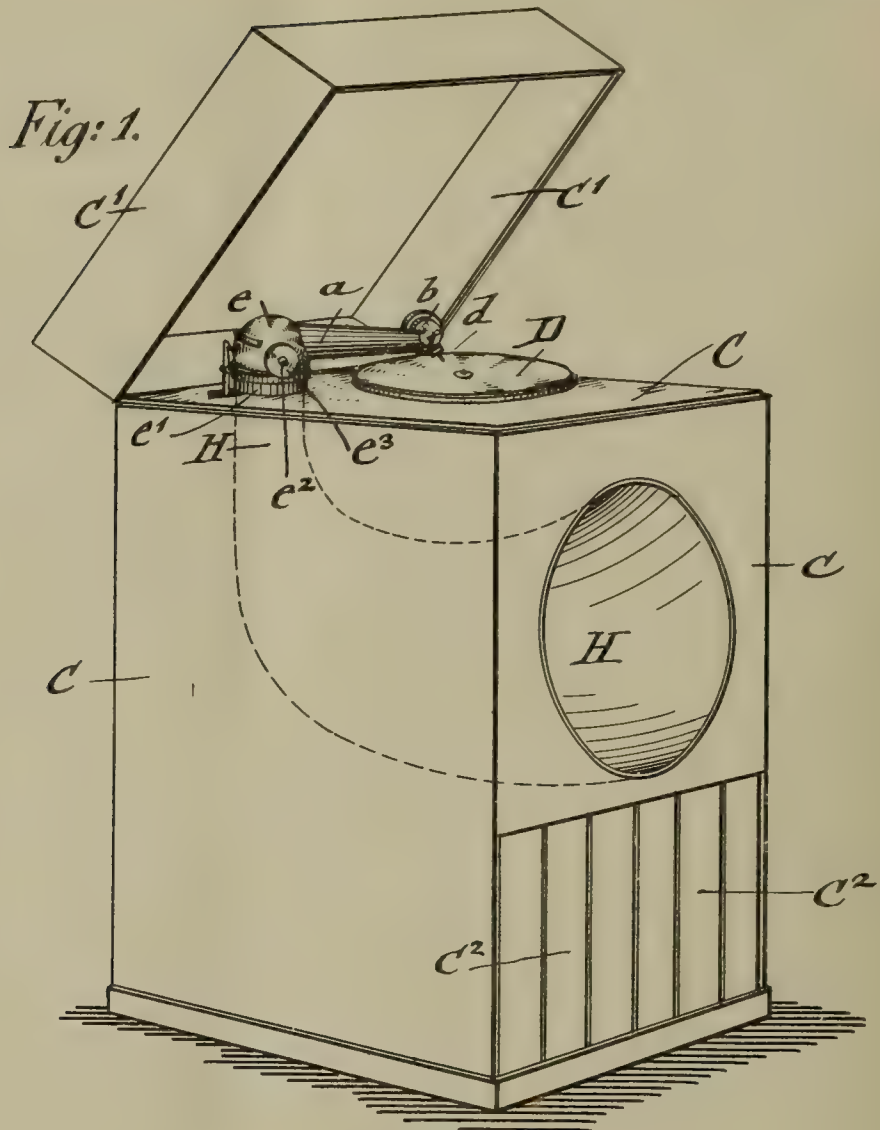
OTTO V. SCHRENK,
JOHN LOTKA.



962,833.

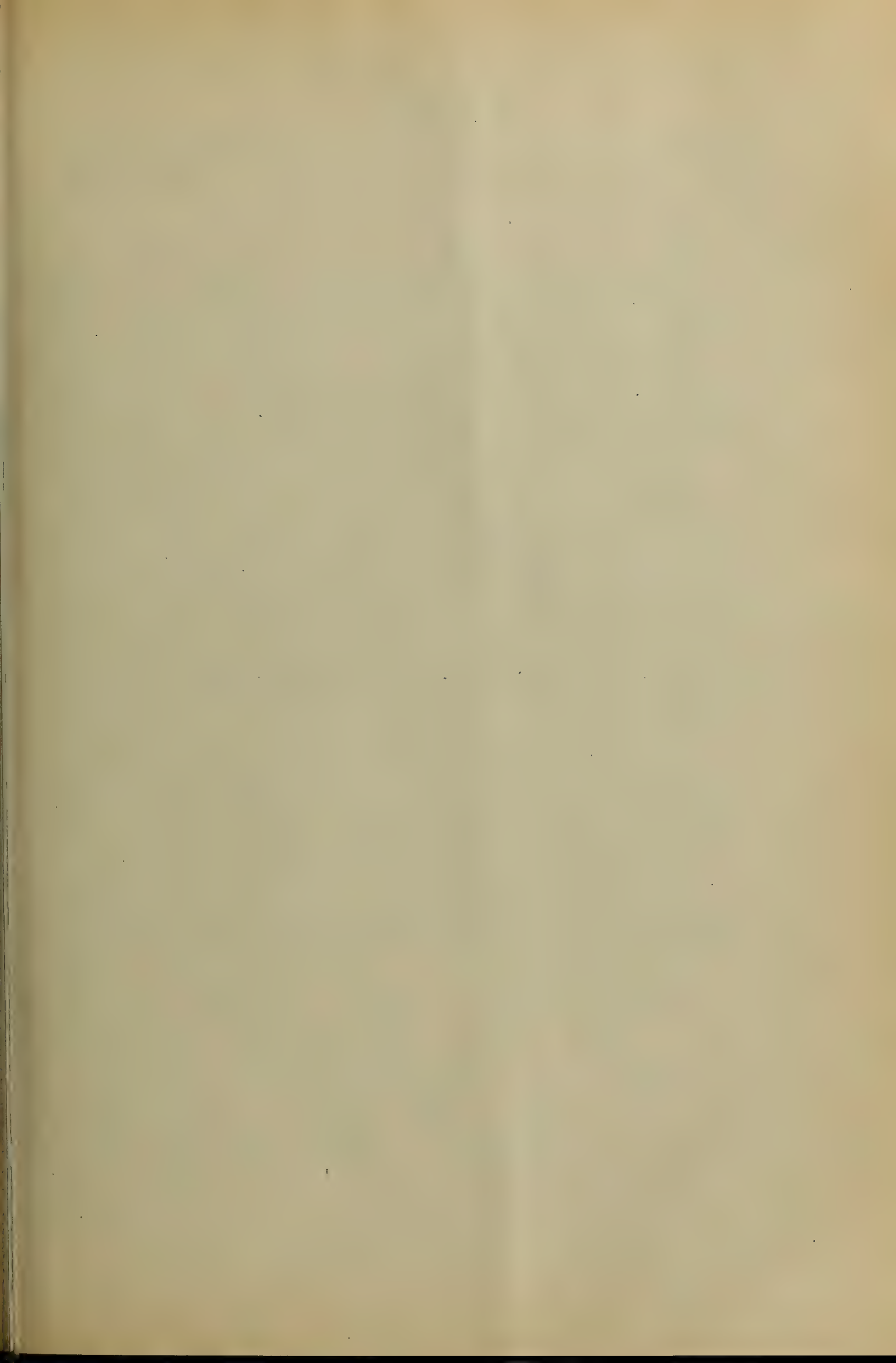
Patented June 28, 1910.

2 SHEETS—SHEET 1.



WITNESSES:
John Murtagh
William J. Murphy

INVENTORS
Fredrick Haye
and *Charles Wessels*
BY *Ernest Vogel*
ATTORNEYS



F. HAYE & C. WESSELS.

GRAMOPHONE.

APPLICATION FILED JAN. 24, 1910.

962,833.

Patented June 28, 1910.

2 SHEETS—SHEET 2.

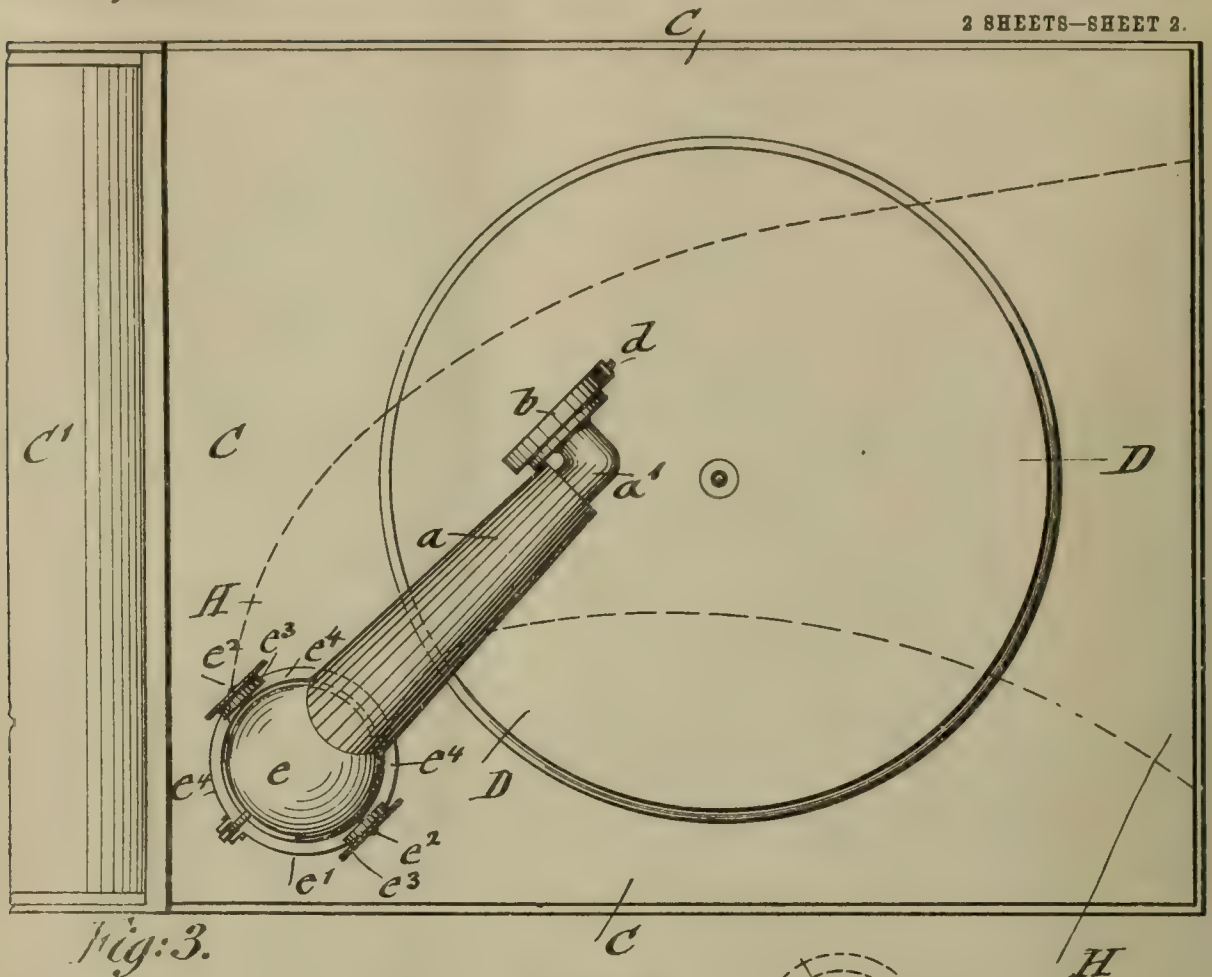


Fig: 3.

Fig: 4.

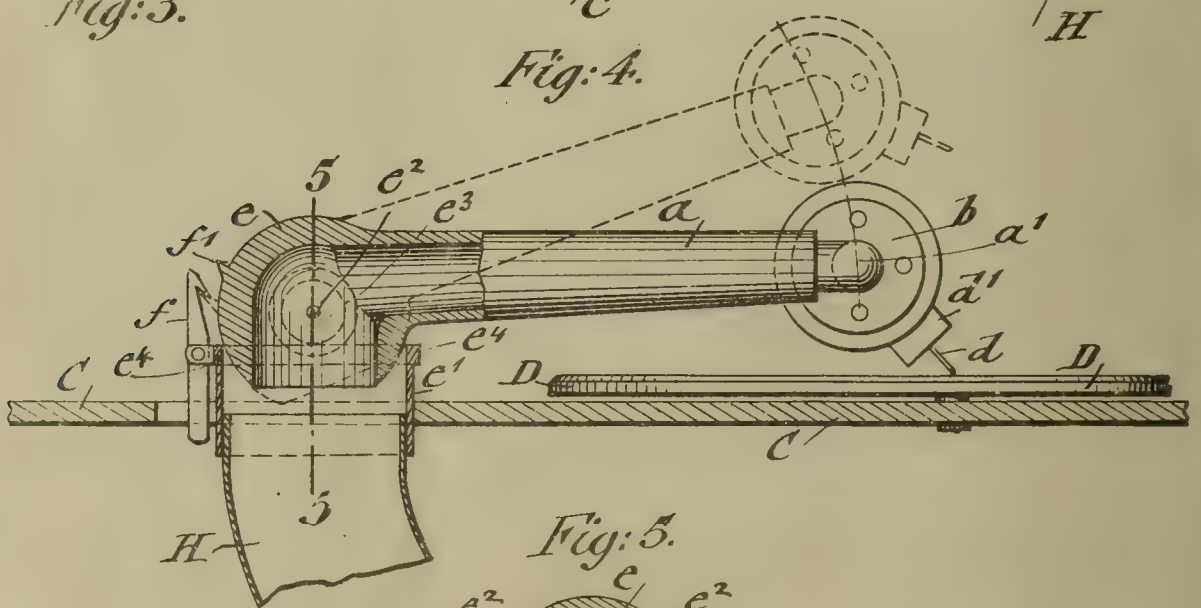
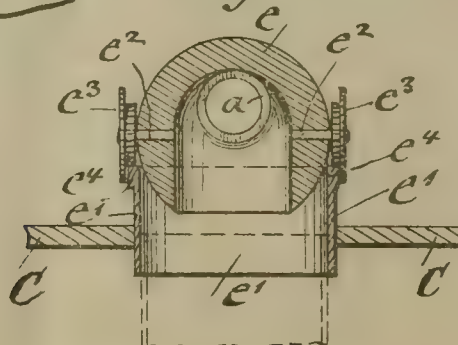


Fig: 5.



WITNESSES:

John Murtagh
d. J. Murphy

INVENTORS
Frederick Haye
and Charles Wessels
BY
Gospel & Gospel
ATTORNEYS

UNITED STATES PATENT OFFICE.

FREDERICK HAYE AND CHARLES WESSELS, OF WOODHAVEN, NEW YORK.

GRAMOPHONE.

962,833.

Specification of Letters Patent. Patented June 28, 1910.

Application filed January 24, 1910. Serial No. 539,666.

To all whom it may concern:

Be it known that we, FREDERICK HAYE and CHARLES WESSELS, citizens of the United States of America, residing in Woodhaven, in the county of Queens and State of New York, have invented certain new and useful Improvements in Gramophones, of which the following is a specification.

This invention relates to an improved gramophone of that type in which no separate and detachable horn is used, but in which the horn is permanently located in a casing below the record-carrying disk and its actuating motor.

The separate and detachable horns used in phonographic apparatus heretofore, are objectionable for the reason that they render the apparatus cumbersome, as the horn takes up a great deal of space, and as it impairs to some extent the clearness of the delivery of the phonographic records. By dispensing with the separate horn and its supporting stand, the entire apparatus becomes handier, more conveniently transportable and more easily storable when not required for use.

This invention is designed to furnish a phonographic apparatus in which the horn is arranged in a supporting casing below the record-carrying disk and connected with a tubular tone-arm carrying the diaphragm-box by a universal joint provided with means for holding the tubular arm and diaphragm-box in raised position.

The invention consists further of certain details of construction which will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a perspective view of our improved phonograph, Fig. 2 is a detail side-elevation of the tubular tone-arm carrying the diaphragm-box and showing the universal joint connection with the inner end of the horn, drawn on a larger scale, Fig. 3 is a plan-view of Fig. 2, and Figs. 4 and 5 are respectively a sectional side-elevation of the tone-arm and a vertical transverse-section of the same on line 5, 5, Fig. 4.

Similar letters of reference indicate corresponding parts throughout the several figures.

Referring to the drawings, C represents the casing of our improved phonographic apparatus. The casing C is made of rectangular

shape and of a sufficient size to permit the placing in the upper part of the same of a sound-delivering horn H and other accessories, such as the record-carrying disk or turntable D and the motor for the same (not shown). To the upper rear-end of the casing C is applied a hinged cover C¹ so that the record-carrying disk or turntable D and the tone-arm *a* with the diaphragm-box *b* at its front-end and the universal joint connection with the horn H can be protected against dust and meddling when not required for use.

The front-end of the tubular tone-arm *a* is connected by a curved tube *a*¹ with the diaphragm-box *b* in the usual manner. The diaphragm-box *b* carries a socket *d*¹ for receiving the stylus *d* in the usual well-known manner. The tubular tone-arm *a* is made tapering and increasing in diameter from the front toward the rear-end and provided at its rear-end with a hollow spherical portion *e* which is cut off at its lower portion so as to form at its interior a smooth rounded off continuation of the tubular tone-arm. The lower portion of the spherical portion *e* extends into and opens into a tubular socket *e*¹ that is seated in the top-plate of the casing at the rear of the disk D.

The spherical portion *e* of the tone-arm *a* is fitted into the upper end of the socket *e*¹, so that the tone-arm can be moved up and down in following the motion of the stylus in the grooves or depressions of the record. The lower open part of the spherical portion *e* extends to some extent into the socket *e*¹ so as to transmit the sound-waves into the inner or rear-end of the horn H connected therewith as shown in Fig. 4. The spherical portion *e* is preferably made of aluminum or other light metal so as to offer as little resistance as possible to the up and down motion of the tone-arm *a*. The upper end of the socket *e*¹ is provided at diametrically opposite sides on an axis at right angles to the longitudinal axis of the tone-arm and spherical portion with short fixed shafts *e*² on which are mounted flanged disks *e*³ which move over the shouldered circumference or rim *e*⁴ of the upper edge of the tubular socket *e*¹, while the flanges of the disks move along the outer edge of the shouldered rim of the socket, as shown clearly in Figs. 2 and 5.

The weight of the inner end of the tone-

arm and its spherical portion e rests by the shouldered disks e^3 , on the upper rim e^4 of the socket and permits the easy swinging of the tone-arm in up and down, as well as in lateral direction, while the circumferential flanges of the disks act as guard-flanges for keeping the spherical portion on the upper end of the socket e^1 . The spherical portion e of the tone-arm a in connection with the shouldered rim e^4 and the flanged disks e^3 moving over the rim form a kind of universal joint for permitting the free and easy movement of the tone-arm together with the diaphragm-box and stylus at the front-end of the same in following the depressions of the record, without exerting any strain on the needle or stylus. The diaphragm-box and its needle-holder are made in the usual approved manner.

The universal joint between the tone-arm and the socket at the inner end of the horn follows the motion of the needle or stylus in the grooves of the phonographic record, so that the sound-waves embodied in the grooves are transmitted to the enlarged outer end of the horn.

The lower part of the case C is preferably utilized for the storage of records in the spaces formed between vertical partitions C^2 . The outlet-opening of the horn and the partitioned space at the lower part of the casing may be closed by means of hinged doors in the usual manner, so as to permit the closing of the casing and prevent the entrance of dust into the horn and the partitions C^2 in the lower part of the casing.

When it is desired, to replace a record by a new one, the tone-arm a is raised and retained in raised position by a hook f which is fulcrumed to the shouldered rim e^4 of the socket e^1 , which hook engages a segmental shoulder f^1 at the rear of the spherical portion e , as shown in dotted lines in Fig. 4. The hook f is weighted or spring-actuated at its lower end. When the new record is placed in position on the disk D, the hook is released from the shoulder f^1 and the tone-arm and diaphragm-box are returned into lowered or normal position, the stylus being then placed into contact with the outermost groove of the record in the usual manner.

Having thus described our invention, we claim as new and desire to secure by Letters Patent:

1. In a phonographic apparatus, the combination, with a casing, of a tubular tone-arm carrying a diaphragm-box and stylus at its front-end, of a curved horn supported in said casing, a universal joint connecting the rear-end of the tone-arm with the inner end

of the horn, and a pair of rollers for supporting the inner end of the tone-arm.

2. In a phonographic apparatus, the combination, with a casing, of a record-carrying disk or turntable, a tubular tone-arm, a diaphragm-box provided with a stylus or needle applied to the front-end of the tone-arm, a stationary socket in said casing and provided with an annular shoulder, a horn connected at its inner end with the lower end of said socket, a universal joint between said socket and the opposite end of the tubular tone-arm, and a pair of disks rotatably mounted on the inner end of the tone-arm and bearing on said shoulder.

3. In a phonographic apparatus, the combination, with a casing, of a rotary record carrying disk, a horn located in said casing, a tubular socket member supported on the top of the casing and communicating with the inner end of the horn, a tubular tone arm having a spherical portion fitted into the upper end of the socket member, rollers rotatably supported on said spherical portion and adapted to roll on the upper edge of the socket member, an upwardly disposed horizontally extending segmental shoulder on the rear part of said spherical portion, a pair of ears at the rear of the socket member, a hook pivoted between said ears and adapted to engage said shoulder and having a downward weighted extension and a diaphragm box on said tone arm.

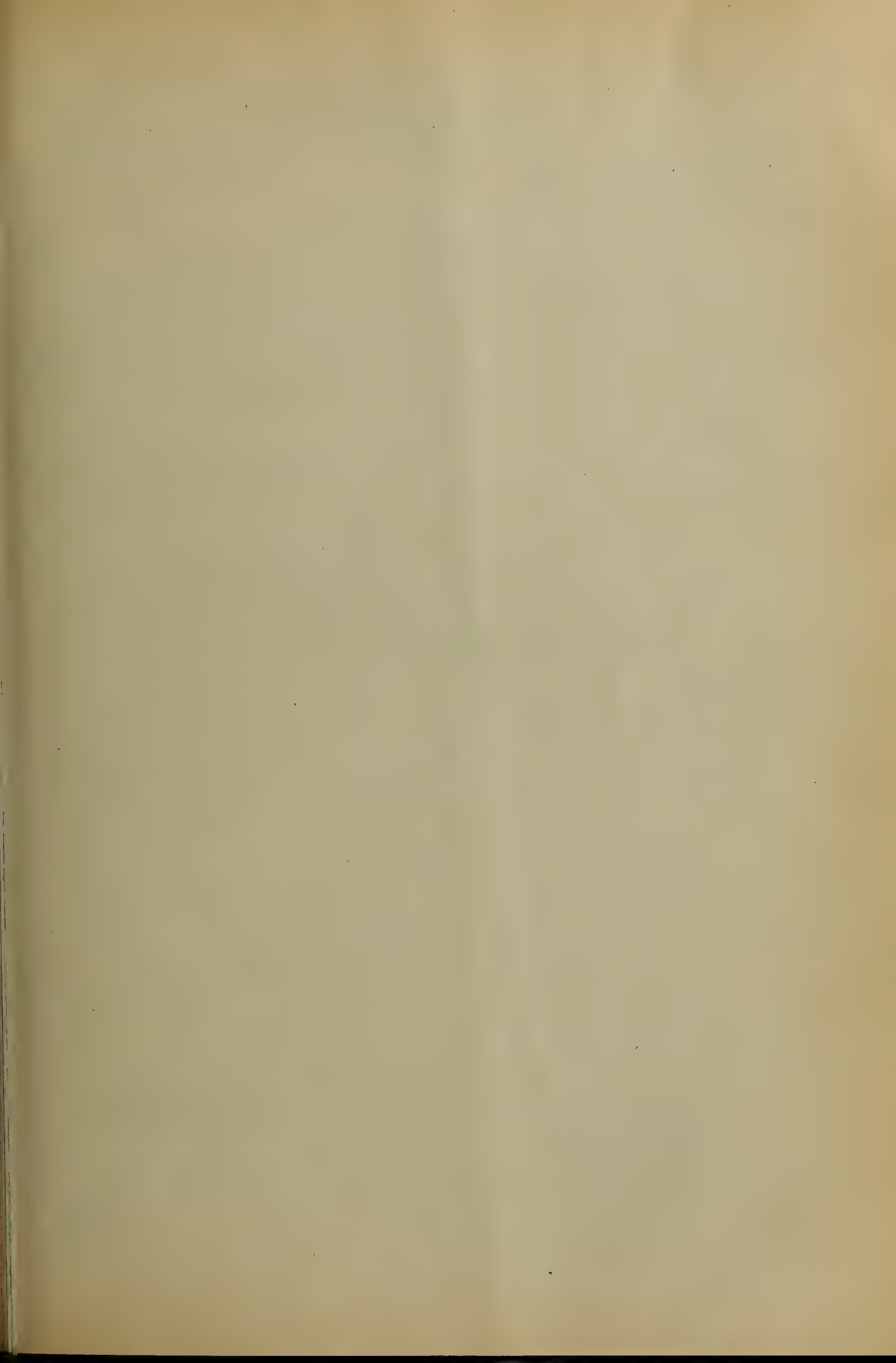
4. In a phonographic apparatus, the combination, with the casing, of a rotary record-carrying disk or turn-table at the upper part of said casing, a curved horn located in said casing and opening in the front-wall of the same, a stationary socket having a shouldered rim at its upper end and located in the top of the casing and connected at its lower end with the inner end of the horn, a tone-arm provided with a spherical portion fitted into the upper end of the socket, a pair of flanged disks rotatably mounted at diametrically-opposite points of the spherical portion and engaging and moving over the rim of the socket, and a diaphragm-box at the front-end of the tone-arm and provided with a needle or stylus, the lower open end of the spherical portion of the tone-arm extending to some distance into said socket.

In testimony, that we claim the foregoing as our invention, we have signed our names in presence of two subscribing witnesses.

FREDERICK HAYE.
CHARLES WESSELS.

Witnesses:

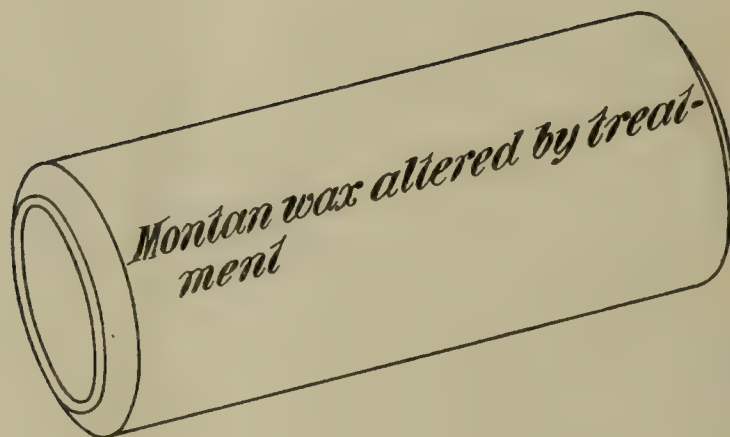
PAUL GOEPEL,
JOHN MURTAGH.



J. W. AYLSWORTH.
COMPOSITION FOR PHONOGRAPH RECORDS.
APPLICATION FILED NOV. 5, 1907.

962,878.

Patented June 28, 1910.



Witnesses:
Frank Denvir
Dyer Smith

Inventor:
J. W. Aylsworth
by Frank L. Dyer
Atty.

UNITED STATES PATENT OFFICE.

JONAS W. AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

COMPOSITION FOR PHONOGRAPH-RECORDS.

962,878.

Specification of Letters Patent. Patented June 28, 1910.

Application filed November 5, 1907. Serial No. 400,849.

To all whom it may concern:

Be it known that I, JONAS W. AYLSWORTH, a citizen of the United States, residing at 223 Midland avenue, East Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Composition for Phonograph-Records, of which the following is a description.

My invention relates to an improved composition for molded phonograph records, and the principal object is to produce a composition or material for the purpose in which the capacity to resist wear or the rubbing action of the reproducer stylus, will be enormously increased, whereby it becomes commercially and practicably feasible to make phonograph records with a very fine pitch record grooves. A phonograph record having a record-groove of a pitch of 200 threads per inch made of my improved composition or material, will compare favorably in wearing qualities with a record of a pitch of 100 threads per inch made of present compositions.

A further object is the production of a composition or material which shall have an extremely smooth record surface so as to reduce as much as possible the production of foreign noises, due to the rubbing action of the reproducer stylus; and also, to produce a composition or material which shall contain no hygroscopic ingredients, such as the alkaline soaps which are present in compositions now generally in use.

In Letters Patent of the United States No. 880,707 granted Mar. 3, 1908, I disclose for the first time in the art, as a suitable material for use in compositions for molded phonograph records, the article known in commerce as "montan wax," which is a wax-like substance of a dark yellowish brown color, somewhat resembling discolored carnauba wax, and obtained, as I am informed and believe, from certain kinds of bituminous brown coal by a certain process of extraction or solution. The so-called montan wax is imported into the United States from Germany, and is a mineral wax obtained from certain kinds of bituminous brown coal by extraction with suitable solvents. Chemically, it consists of a mixture of high carbon acids combined with fatty alcohols together with some free fatty acids and hydrocarbons. While the details of the

process of manufacture are kept as secrets by the manufacturers of this material, I know that it can be obtained from certain kinds of bituminous brown coal according to the process of United States Patent No. 689,381, dated December 24, 1901. The product which is obtained after driving off the benzin or benzene, and which is described in lines 44 to 47, page 1 of the patent, is the same substance as the article known in commerce as montan wax.

In my said patent, while claiming broadly the use of montan wax as an ingredient in these compositions, the particular composition described, made use of the wax in comparatively small proportions. I have conducted experiments with the view of utilizing very much larger proportions of the montan wax, in order to secure a material for the purpose, which shall be of great hardness or toughness, and have succeeded in so treating the montan wax that it may be used alone as a material for this purpose, or admixed with small proportions of other ingredients. The montan wax in its natural state, possesses some of the properties that are desirable in the art, but I find that it cannot be molded successfully, because of its excessive shrinkage, while when mixed with other bodies, such as asphalt (to reduce the shrinkage), the resulting surface is rough and scratchy. I have discovered, however, that the objectionable features of montan wax may be overcome and the material be made eminently suitable for use in the art, by prolonged heating of the wax at a temperature of from 500° to 540° F. in the presence of a small percentage of sulfur, and preferably with the subsequent centrifuging of the product. When the montan wax is so treated, it is greatly altered in its physical properties, and may be used for the purpose either alone or admixed with small proportions of other bodies. I find that to secure the best results, there should be present in the wax about one and one-half per cent. of sulfur. Apparently, the proportion of sulfur in the crude wax varies from one and one-half per cent. to practically nothing, so that in the treatment of some bodies there will be sufficient sulfur present to secure the desired results, while in the treatment of other bodies sufficient sulfur should be added to result in a sulfur content of about one and one-half

per cent. The wax is first melted in a suitable kettle, heated by steam or gas, and the sulfur added, if necessary, and the temperature is slowly raised to from 500° to 540° F., being maintained between these points for from two to six hours, according to the particular grade of wax being treated. The percentage of sulfur may be varied within narrow limits, but, if too much is added, or is present, the resulting material will not possess sufficient shrinkage for a rapid and highly successful molding operation. On the other hand, if the percentage of sulfur present or added, is too small, the shrinkage of the material will be excessive, resulting in a too rapid clearance from the mold, in the warping of the record-groove, and in the presence of a less smooth surface than can be secured by a proper regulation of the proportion of sulfur. The temperature may also be varied within certain limits, but if too low, the time of heating must be greatly prolonged to effect the desired reduction in the normally excessive shrinking properties of the material, and furthermore, the sulfur will not, in this case, enter into such a fixed combination, and is therefore liable to deleteriously affect the matrix or mold in which the records are made. If the temperature is maintained materially above 540° F., objectionable properties are manifested in the insufficient shrinkage of the material, which is therefore less desirable. The best results are (at least with those examples of montan wax with which I have experimented) obtained when the heating is regulated between 500° and 540° F. and when the percentage of sulfur is maintained closely in the neighborhood of one and one-half per cent., as above stated. As a result of the treatment indicated, I obtain a very much tougher and less brittle substance, which has the special shrinkage properties necessary in the art, but this material contains a gummy sediment, which is very finely divided and which floats in the material when molten. I have not been able to remove this sediment by filtration or by settling operations, however carefully they may be performed or attempted. I have discovered, however, that by subjecting the molten material to the action of a centrifuge, this gummy sediment may be entirely removed, thereby resulting in a material which is vastly improved in its molding properties, and in its ability to withstand the wearing action of the reproducer stylus. The amount of the gummy sediment which seems to be always present in montan wax that has been heated to a high temperature, varies from one per cent. to five per cent. according to the grade of the wax used. Yet, notwithstanding this apparently small percentage, I find that by removing the sediment as explained, the ability of the material to withstand the

wearing action of the reproducer stylus is more than doubled, while at the same time, the material is more readily molded.

Reference is hereby made to the accompanying drawing, which shows a phonograph record tablet with the names of the ingredients inscribed thereon.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is as follows:—

1. A material or ingredient for molded phonograph records, comprising montan wax which has been subjected to prolonged heating at a high temperature, as set forth.

2. A material or ingredient for molded phonograph records, comprising montan wax which has been subjected to prolonged heating at a high temperature in the presence of a small percentage of sulfur, as set forth.

3. A material or ingredient for molded phonograph records, comprising montan wax which has been subjected to prolonged heating at a high temperature and freed from the gummy sediment produced by such treatment, as set forth.

4. A material or ingredient for molded phonograph records, comprising montan wax which has been subjected to prolonged heating at a high temperature in the presence of a small percentage of sulfur and freed from the gummy sediment produced by such treatment, as set forth.

5. A material or ingredient for molded phonograph records, comprising a mineral wax obtained from bituminous brown coal by extraction with suitable solvents, and subjected to prolonged heating at a high temperature, substantially as set forth.

6. A material or ingredient for molded phonograph records, comprising a mineral wax obtained from bituminous brown coal by extraction with suitable solvents, the same comprising a mixture of high carbon acids combined with fatty alcohols together with some free fatty acids and hydrocarbons, and subjected to prolonged heating at a high temperature, substantially as set forth.

7. A material or ingredient for molded phonograph records comprising a mineral wax, the same comprising a mixture of high carbon acids combined with fatty alcohols together with some free fatty acids and hydrocarbons, and subjected to prolonged heating at a high temperature, substantially as set forth.

8. A molded phonograph record formed of montan wax so treated as to have lost the excessive shrinkage characteristic of untreated and unmixed montan wax, substantially as set forth.

9. The process of rendering montan wax suitable as a material, or predominating ingredient in a composition, for molded records, which consists in subjecting the same

to prolonged heating at a temperature of from 500° to 540° F., as set forth.

10. The process of rendering montan wax suitable as a material, or predominating ingredient in a composition, for molded records, which consists in subjecting the same to prolonged heating at a high temperature in the presence of about one and one-half per cent. of sulfur, as set forth.
11. The process of rendering montan wax suitable as a material, or predominating ingredient in a composition, for molded rec-

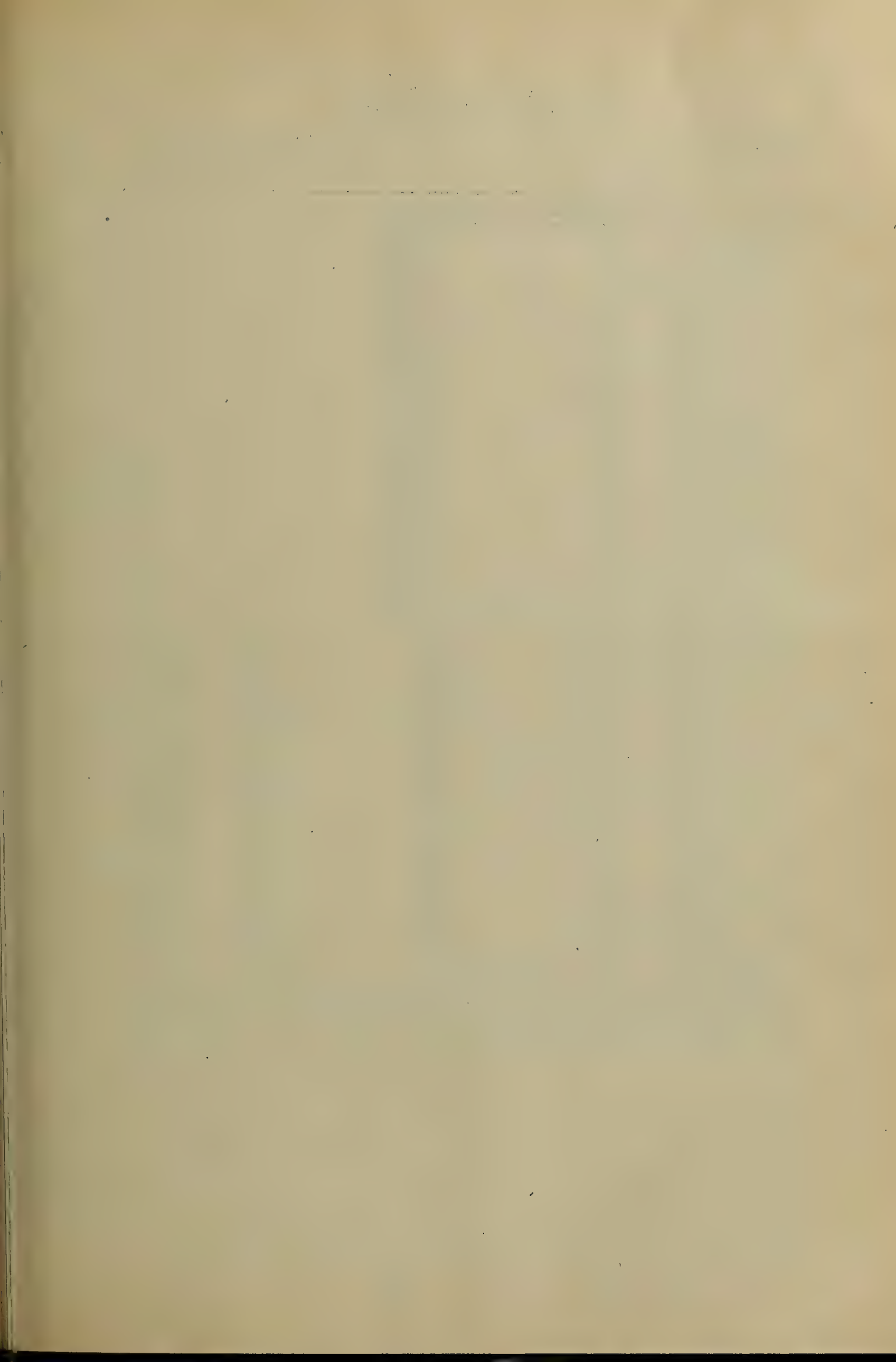
ords, which consists in subjecting the same to prolonged heating at high temperature, and in then centrifuging the molten material so as to remove the gummy sediment produced by such heating, as set forth.

This specification signed and witnessed this 26th day of Oct. 1907.

JONAS W. AYLSWORTH.

Witnesses:

FRANK D. LEWIS,
CHARLES F. ROBSON.

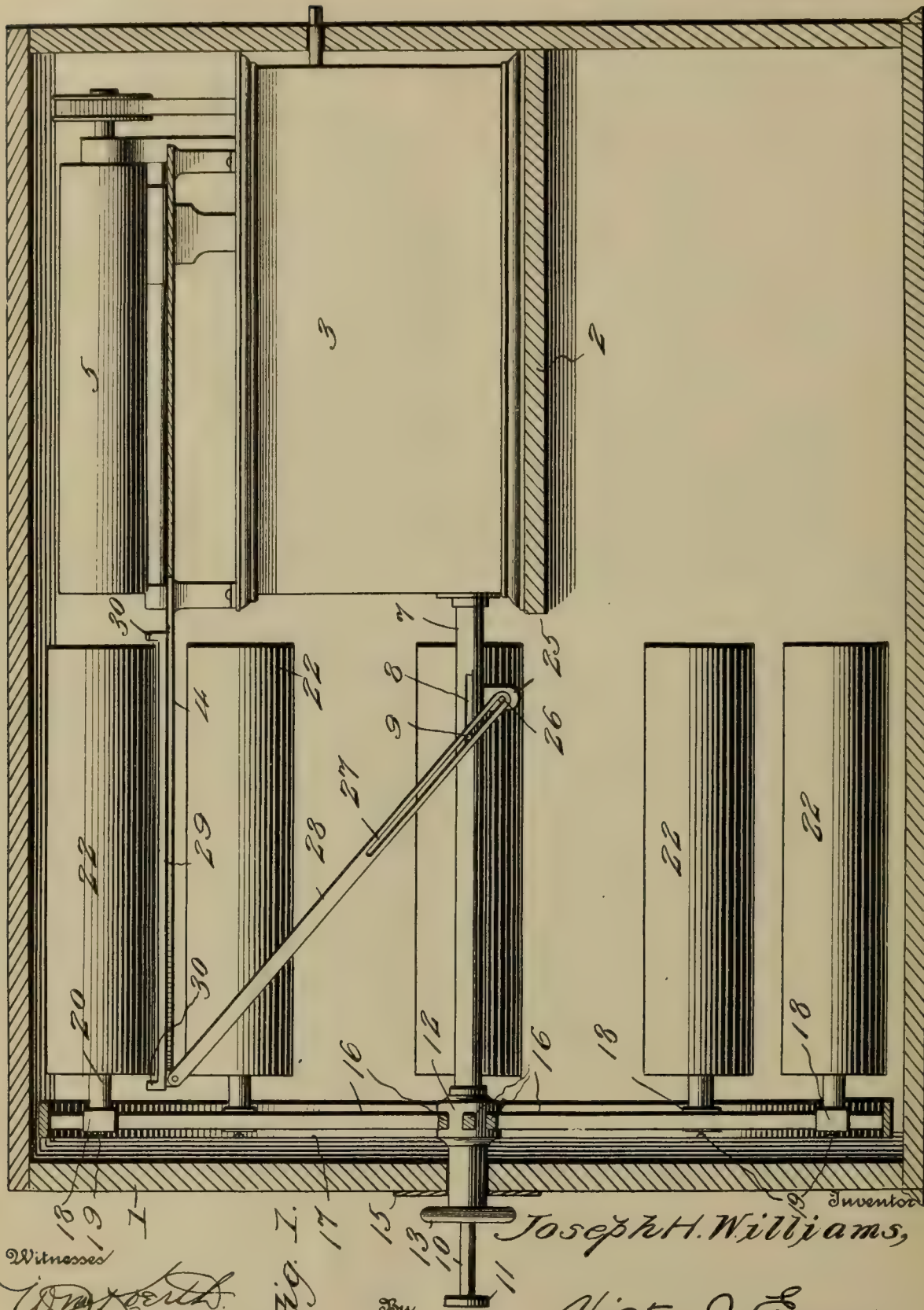


J. H. WILLIAMS.
 FEED APPARATUS FOR PHONOGRAPHS.
 APPLICATION FILED DEC. 31, 1902.

963,195.

Patented July 5, 1910.

3 SHEETS—SHEET 1.



Witnesses
Wm. H. Smith
Robert D. Lawson

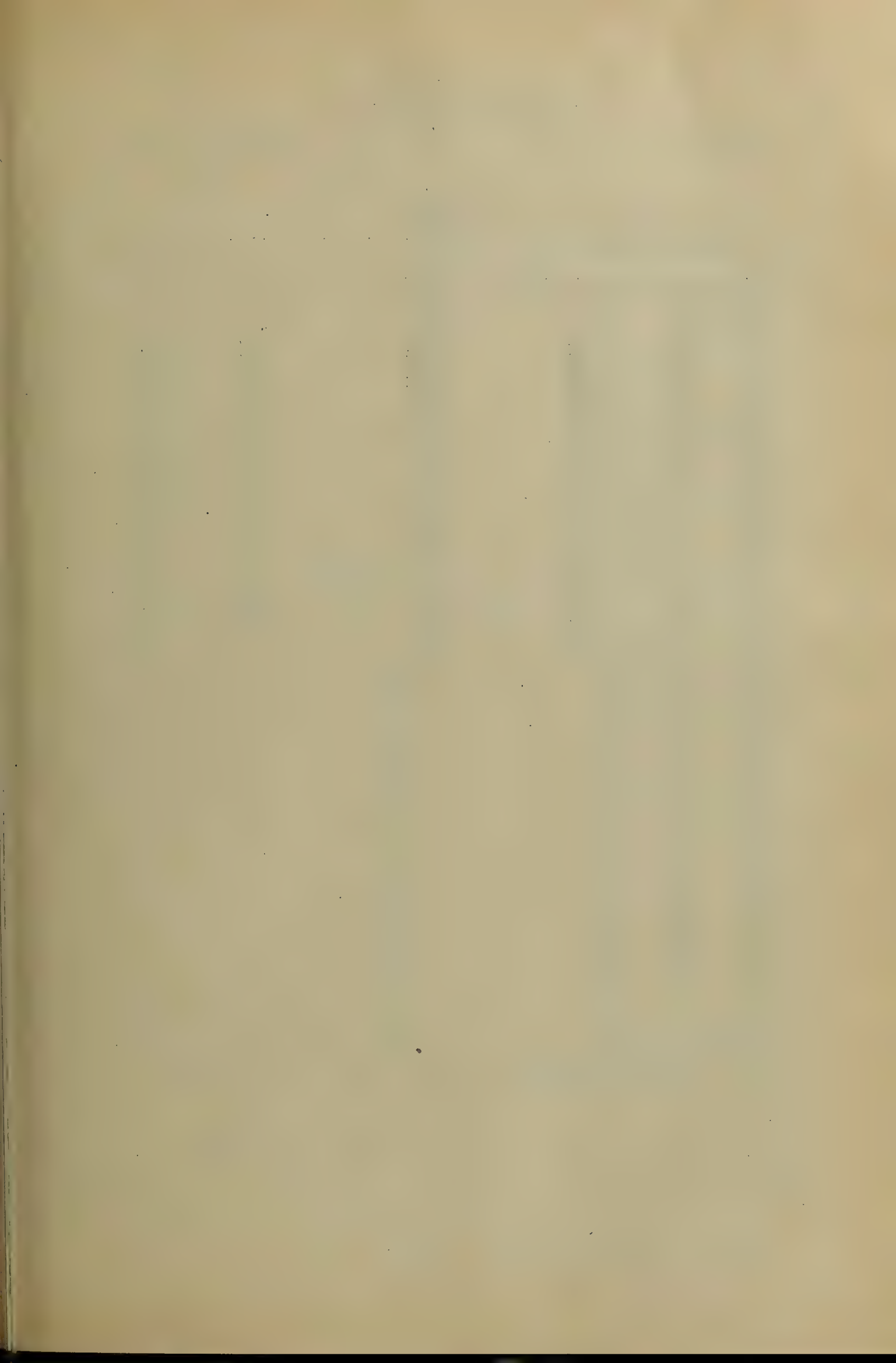
Fig. 1.

By

Joseph H. Williams,

Victor J. Evans

Attorney

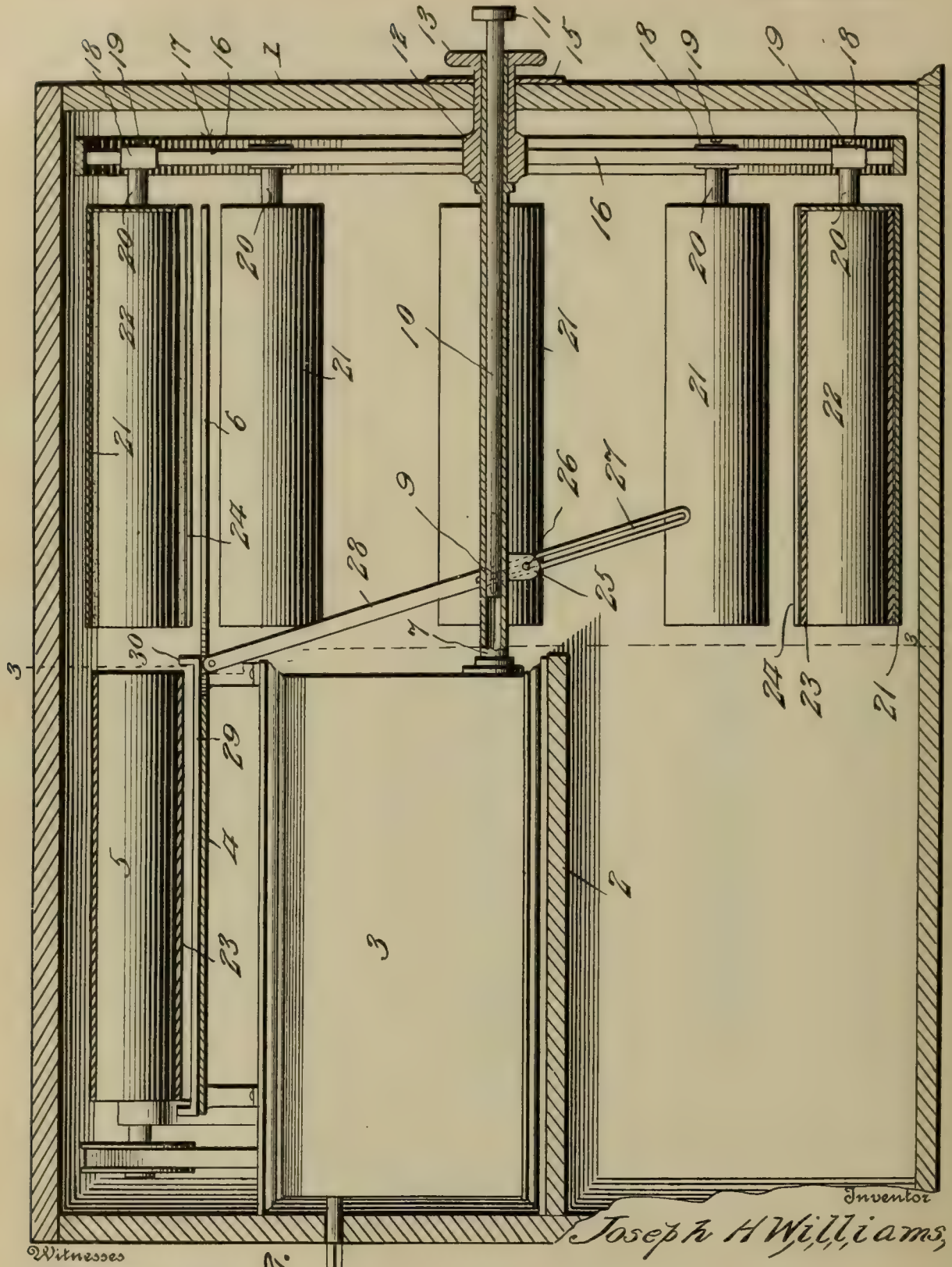


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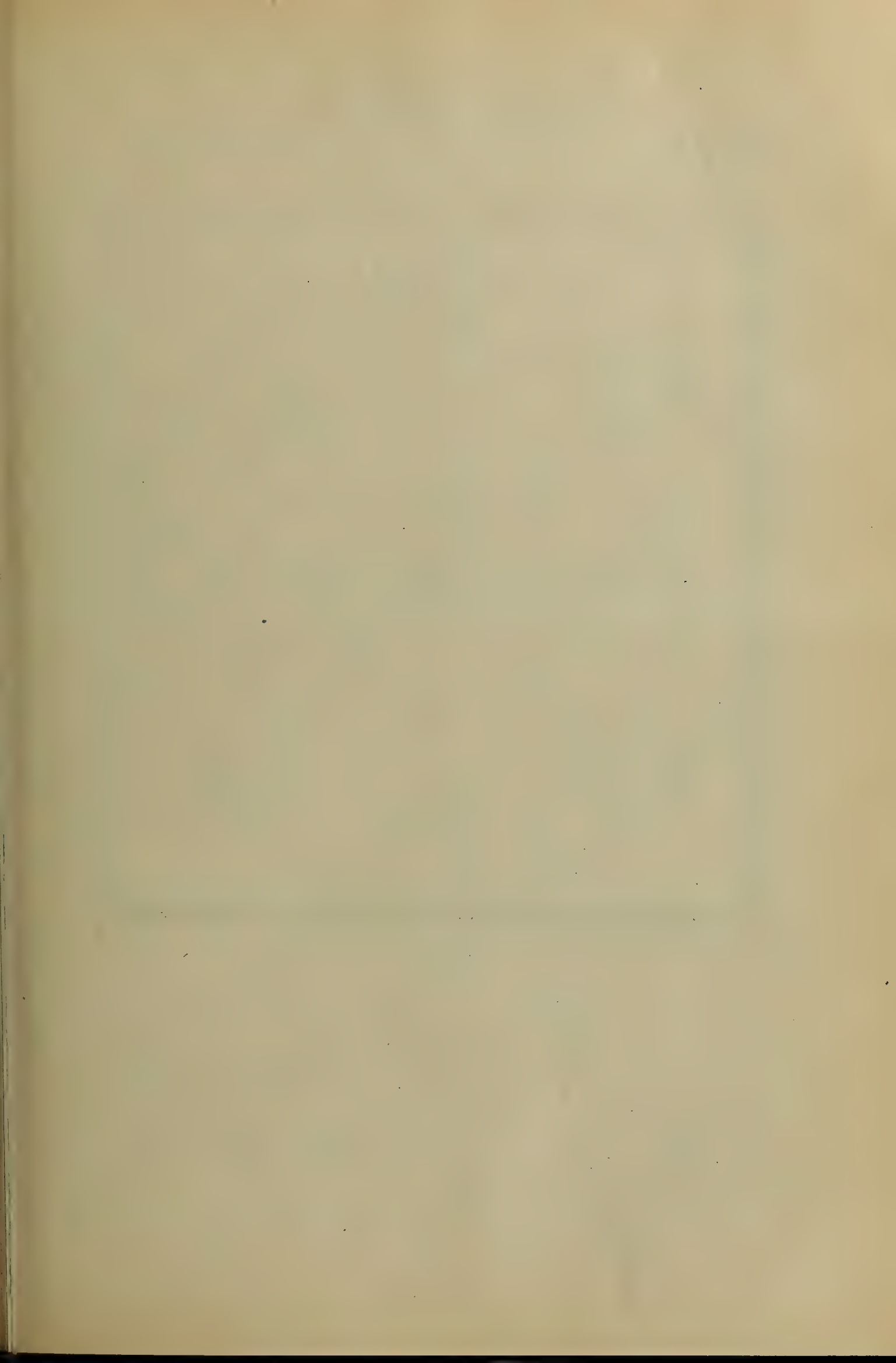
3 SHEETS—SHEET 2.



Witnesses
 Wm. K. Smith
 Hubert A. Lussac
 Fig. 2.

By

Victor J. Evans
 Attorney



J. H. WILLIAMS.
 FEED APPARATUS FOR PHONOGRAPHS.
 APPLICATION FILED DEC. 31, 1902.

963,195.

Patented July 5, 1910.

3 SHEETS—SHEET 3.

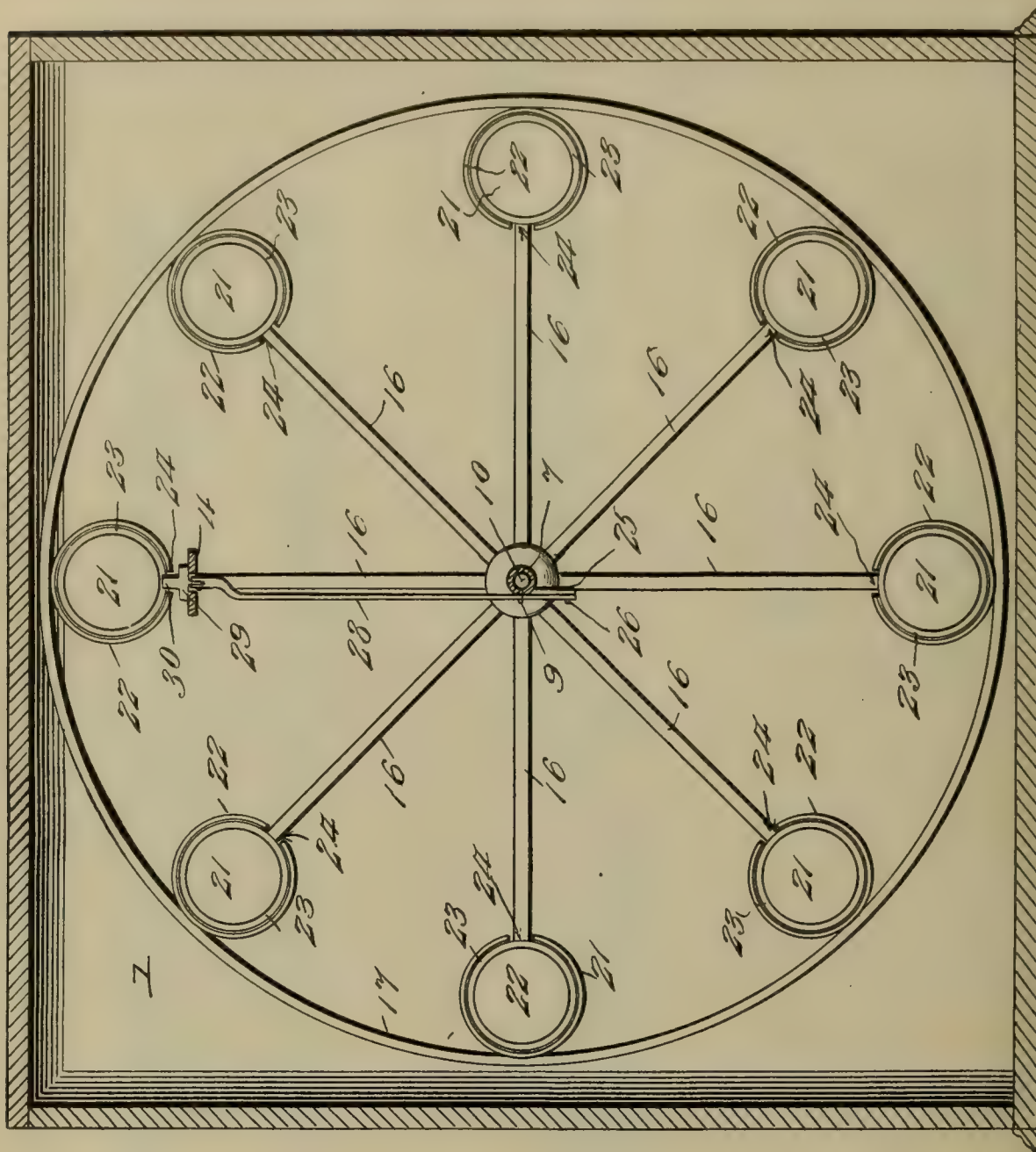
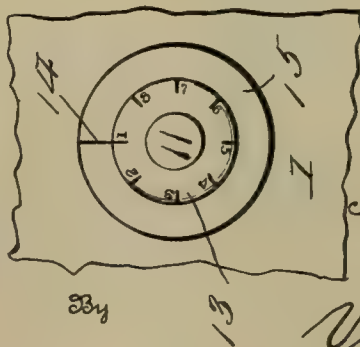


Fig. 3

Fig. 4.



Witnesses
Wm. North
Robert Lawson

Inventor
Joseph H. Williams

Victor J. Evans
 Attorney

UNITED STATES PATENT OFFICE.

JOSEPH H. WILLIAMS, OF HARPER, KANSAS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
GEORGE H. UNDERHILL, OF BOSTON, MASSACHUSETTS.

FEED APPARATUS FOR PHONOGRAPHS.

963,195.

Specification of Letters Patent.

Patented July 5, 1910.

Application filed December 31, 1902. Serial No. 137,314.

To all whom it may concern:

Be it known that I, JOSEPH H. WILLIAMS, a citizen of United States, residing at Harper, in the county of Harper and State of Kansas, have invented new and useful Improvements in Feed Apparatus for Phonographs, of which the following is a specification.

My invention relates to new and useful improvements in feed apparatus for phonographs and similar devices employing cylindrical records and its object is to provide means whereby a desired one of a series of records may be promptly placed in, or removed from position upon the cylinder of the phonograph.

The invention consists in arranging a phonograph or similar device within a casing at one end of which is arranged a horizontally extending shaft from which extends a suitable number of spokes. Each spoke is provided with a horizontal spindle connected to a cylinder having a stem therein equal in diameter to the internal diameter of the cylindrical record used in connection with the phonograph. A record is adapted to be placed within each one of these cylinders and upon the stems therein and the spokes to which the cylinders are connected may be readily revolved so as to bring the desired cylinder in horizontal alinement with the record holding cylinder of the phonograph. Each of the cylinders connected to the spokes is provided within its inner face with a slot which is adapted to receive a slide when said cylinder is brought into position in alinement with the phonograph cylinder. Means are provided for operating this slide when desired.

The invention also consists in the further novel construction and combination of parts hereinafter more fully described and claimed and illustrated in the accompanying drawings showing the preferred form of my invention and in which,

Figure 1 is a vertical section through the device and showing the slide and its operating mechanism in operation; Fig. 2 is a central vertical section through the apparatus as it appears from the opposite side; Fig. 3 is a section on line 3—3 of Fig. 2; and Fig. 4 is an elevation of the operating knobs and showing a dial.

Referring to the figures by numerals of reference, 1 is a casing within which is ar-

ranged a shelf 2 adapted to support an ordinary phonograph 3 or other device employing cylindrical records. A guide plate 4 is mounted upon this phonograph at a point directly below the record holding cylinder 5 and is provided with a slotted extension 6 which projects longitudinally therefrom and beyond the inner end of the phonograph. A stationary tubular shaft 7 extends from the inner end of the phonograph and is supported at its outer end within the end of the casing 1. This shaft is slotted at opposite sides as shown at 8, to receive guide pins 9, extending laterally from a plunger 10, slidably mounted within the tube and extending from the outer end thereof, said plunger having a knob 11 whereby the same can be pressed inward or drawn outward by hand.

A sleeve 12 is revolubly mounted upon shaft 7 and extends through the end of casing 1, the outer end of the sleeve being provided with a dial 13 having numerals arranged successively from 1 upward, located adjacent to the periphery thereof. This knob is adapted to be turned in either direction to cause any one of the numerals to register with a mark 14 formed upon a plate 15 secured to the casing and encircling sleeve 12. Extending from the inner end of the sleeve 12 are spokes 16 connected at their outer ends by a rim 17. Adjustably mounted upon each spoke 16 is a slide 18 which may be locked at any suitable point upon the spoke by means of a set screw 19 or other suitable device. A spindle 20 projects rearwardly from each slide 18 and is secured to the center of one end of the cylinder 21 having a longitudinally extending stem 22 centrally arranged therein and equal in diameter to the diameter of cylinder 5 of the phonograph. The space between stem 22 and the inner surface of the cylinder 21 is slightly greater than the thickness of the wall of the record 23 used in connection with the phonograph. A slot 24 extends longitudinally within the inner face of each cylinder 21 and is for the purpose hereinafter more fully described.

An ear 25 depends from the stationary shaft 7 and a lug 26 projects laterally therefrom and engages a slot 27 formed longitudinally within a strip 28. The upper end of this strip is pivoted to the inner end of a slide 29 having upwardly turned ends 30, said slide being slightly greater in length

than the record 23. This slide is mounted upon the plate 4 before referred to and as the slot 27 is engaged by one of the guide pins 9, it is obvious that when knob 11 and plunger 10 are drawn outward, the slide 29 will be moved longitudinally upon the projecting portion 6 of plate 4 and into position between the cylinders 21.

In using the device herein described, a record is placed upon the stem 22 within each cylinder 21 and the plunger 10 is drawn outward to bring the slide 29 into position between said cylinders 21. The sleeve 12 is then revolved by means of knob 13 until the number designating the desired record registers with the mark 14. This will cause the spokes 16 to revolve until the cylinder 21 containing said record has been brought to position in horizontal alinement with cylinder 5 and with its slot 24 directly above slide 29. Plunger 10 is then forced inward and causes strip 28 to swing toward the phonograph, the lug 26 serving as a fulcrum therefor. The slide 29 will be carried with the strip and as the arms or ends 30 thereof are of sufficient length to project over the ends of the record arranged above the slot 24, it is obvious that said record will be moved longitudinally thereby and conveyed from cylinder 21 to cylinder 5, upon which it will be deposited and held by the slide. I have shown this arrangement of the parts in Fig. 2. When it is desired to remove the record from cylinder 5, plunger 10 is drawn outward and the operation of the slide above described is reversed and the record 23 is carried back into its cylinder 21 and one of the remaining cylinders can then be moved into position above the slotted plate 6 and the record extracted therefrom in the manner hereinbefore described.

By using the term "phonograph" I do not wish to limit myself to any particular make of machine. The word is used broadly to cover any form of machine employing cylindrical records for reproducing sounds.

In the foregoing description I have shown the preferred form of my invention, but I do not limit myself thereto, as I am aware that modifications may be made therein without departing from the spirit or sacrificing any of the advantages thereof, and I therefore reserve the right to make such changes and alterations as may fairly fall within the scope of my invention.

Having thus described my invention, what I claim as new and desire to secure by Letters-Patent is:

1. The combination with the record holding cylinder of a phonograph; of a revoluble series of record containing cylinders and means for extracting a record from any one of the cylinders and depositing it upon the record holding cylinder.

2. The combination with the record hold-

ing cylinder of a phonograph; of a revoluble series of record containing cylinders, means for bringing any one of said cylinders in alinement with the record holding cylinder, a slide adapted to engage and remove the record from any one of said cylinders and means for operating the slide.

3. The combination with the record holding cylinder of a phonograph; of a revoluble series of record containing cylinders, means for revolving said series to bring any one thereof into alinement with the record holding cylinder, a slide adapted to project into and engage the record within any one of the cylinders, and means for operating the said slide, whereby a record may be withdrawn from its containing cylinder and deposited upon the holding cylinder of the phonograph.

4. The combination with the record holding cylinder of a phonograph; of a revoluble series of record containing cylinders any one of which is adapted to be brought into alinement with the record holding cylinder, a stem within each containing cylinder adapted to support a record within said cylinder and means for extracting or inserting the record from or into the containing cylinder.

5. The combination with a record holding cylinder of a phonograph; of a revoluble series of record containing cylinders any one of which is adapted to be brought into alinement with the record holding cylinder, a stem within each containing cylinder adapted to support a record within its cylinder, a slide adapted to project into any one of the containing cylinders and engage the record therein and means for operating said slide to remove the record.

6. A record conveying device for phonographs comprising a revoluble series of slotted record containing cylinders, a record supporting stem within each of said cylinders, a guide extending between the cylinders, a slide mounted thereon and adapted to travel within the slot in any one of the cylinders, record engaging ends upon the slide and means for imparting longitudinal movement to the slide.

7. A feed device for phonographs comprising a stationary shaft, a revoluble sleeve thereon, spokes extending from the sleeve, slotted record containing cylinders adjustably secured to the spokes, a stationary guide, a slide mounted thereon and adapted to project into any one of the slots and engage the record within the cylinder, and means for operating said slide whereby longitudinal movement may be imparted to the record.

8. In a record feeding device for phonographs, the combination with a revoluble series of spokes and means for operating the same; of slotted record containing cylinders

adjustably secured to the spokes, a record engaging slide adapted to be moved into the slot in any one of the records, a plunger and means connecting said plunger and slide
5 whereby motion may be transmitted to the slide.

9. In a feed device for phonographs, the combination with a stationary shaft; of a sleeve journaled thereon, means for rotating
10 the sleeve, connected spokes extending from the sleeve, a slotted record containing cylinder secured to each spoke, a guide extending between the cylinders, a record engaging slide mounted upon the guide and adapted
15 to project into any one of the slots, a plunger longitudinally movable within the shaft, and a slotted strip connected to the plunger and slide whereby longitudinal movement may be imparted to the slide from the plun-
20 ger.

10. In combination with a phonograph mandrel adapted to receive a cylindrical record, a magazine having a plurality of mandrels adapted to be successively moved into
25 axial alinement with said phonograph mandrel.

11. In combination with the record-supporting mandrel of a phonograph, a magazine consisting of a plurality of mandrels
30 that may be successively moved into axial alinement with said phonograph mandrel, and means for moving said magazine mandrels successively into alinement with the phonograph mandrel.

12. In combination with the record-supporting mandrel of a phonograph of the class referred to, a magazine consisting of a plurality of mandrels that may be suc-
35 cessively moved into axial alinement with said phonograph mandrel, and means for transferring records from said magazine mandrels to said phonograph mandrel.

13. In combination with the record-supporting mandrel of a phonograph, a maga-

zine consisting of a plurality of mandrels 45 that may be successively moved into axial alinement with said phonograph mandrel, means for transferring records from said magazine mandrels to said phonograph man-
50 drel, and for returning the records from the said phonograph mandrel to the said magazine mandrels.

14. In a multiple record phonograph, the combination with a record carrier for hold-
ing and conveying a series of records, of 55 means for advancing said carrier as a whole with said records to bring successive records into an approximate playing position, and means for shifting a record from said car-
60 rier and from said approximate playing position into an exact playing position.

15. In a multiple record phonograph, the combination with a plurality of cylindrical records, of a holder for said cylindrical rec-
ords, means to free a record from said holder 65 and to shift it to a playing position, and means to present said records successively to said shifting means.

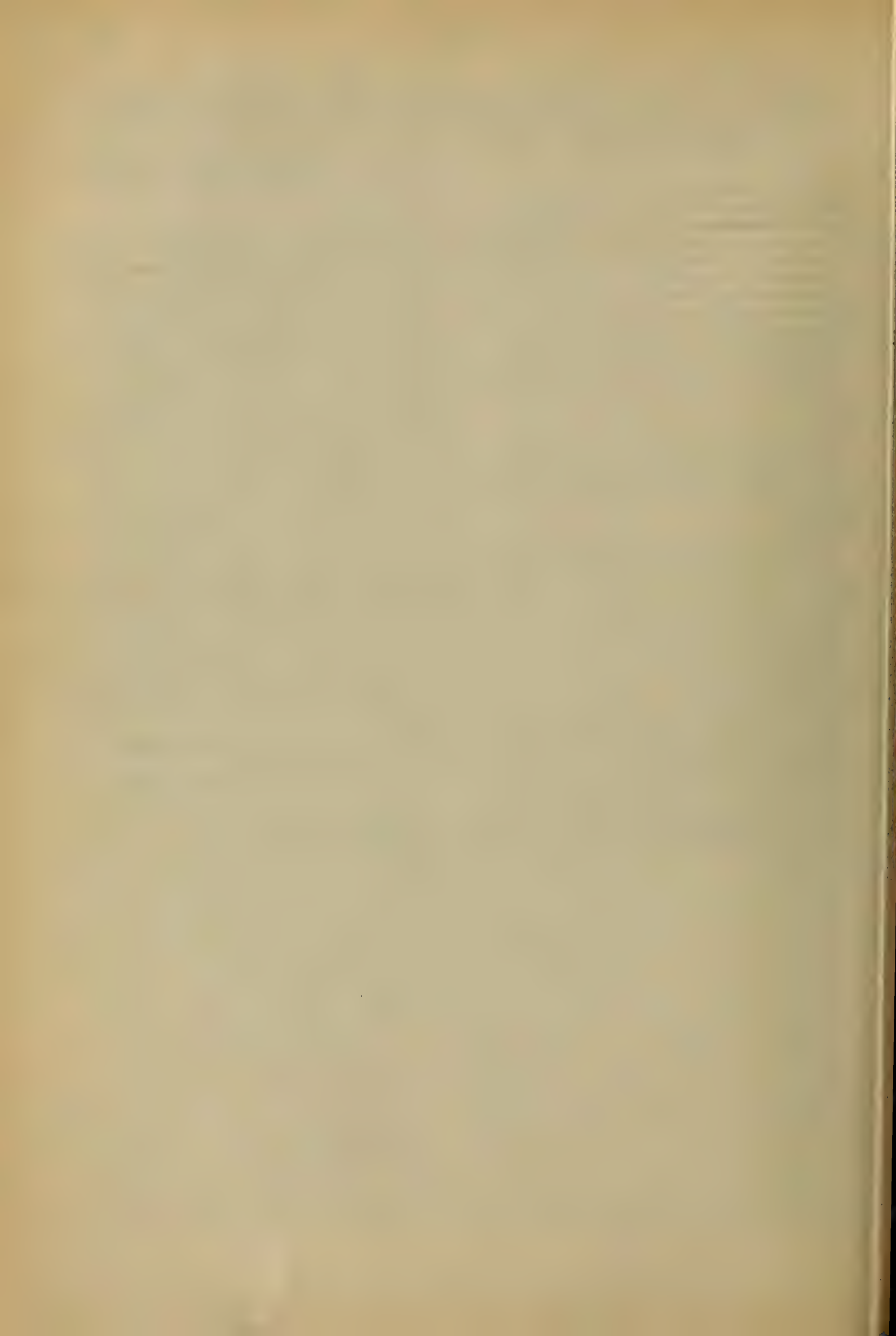
16. In a multiple record phonograph, the combination with a record carrier for hold- 70 ing in serial relation a plurality of cylindrical records, a sound reproducing device, said carrier being movable through a path adjacent the sound reproducing device, means for moving said carrier to bring said 75 cylindrical records successively into an approximate playing position and means to shift a record from the carrier into playing position on the sound reproducing device and then back to the carrier after the record has 80 been played.

In testimony whereof, I affix my signature in presence of two witnesses.

JOSEPH H. WILLIAMS.

Witnesses:

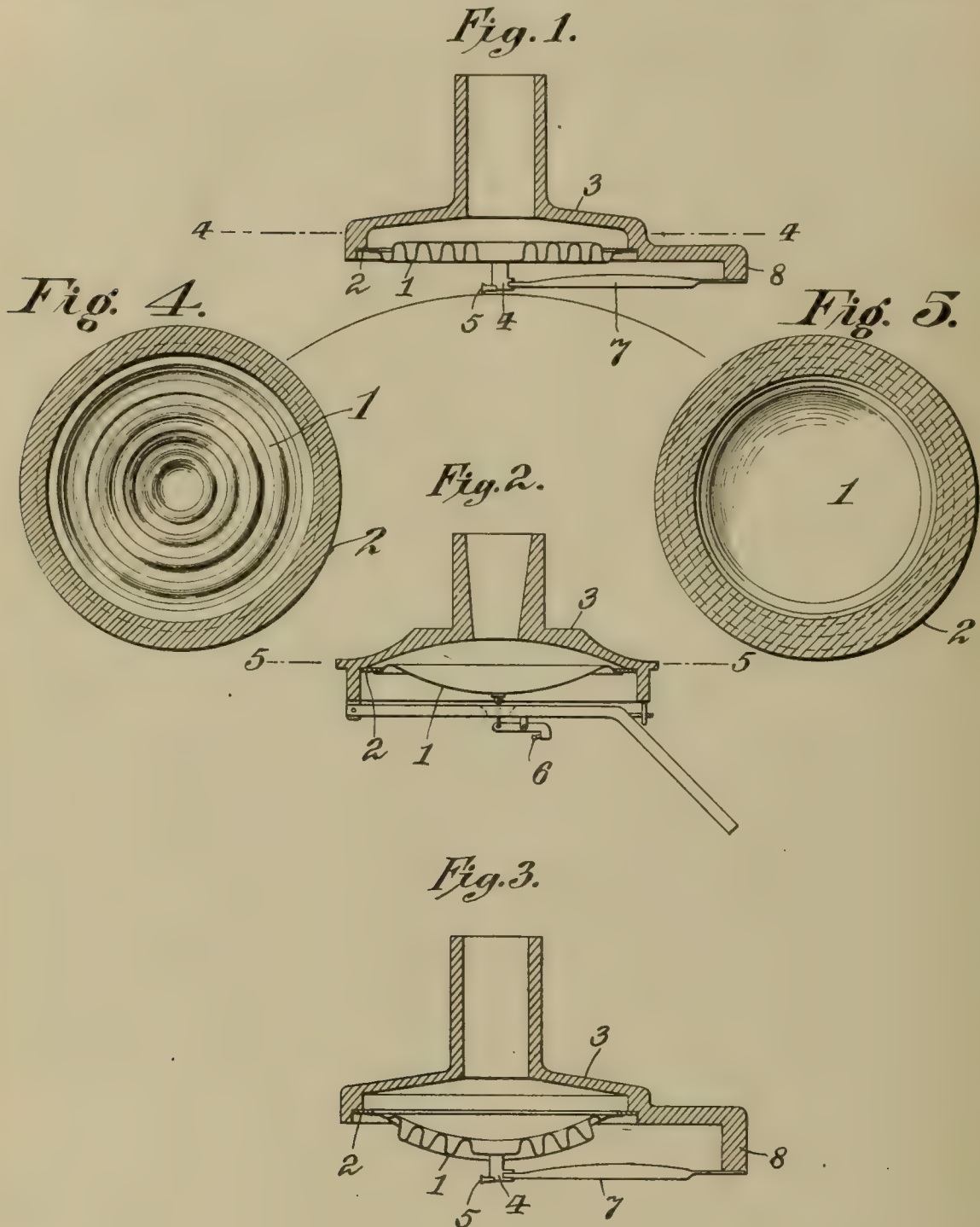
J. S. KNOWLES,
DELLA WILLIAMS.



T. A. EDISON.
 APPARATUS FOR RECORDING OR REPRODUCING SOUNDS.
 APPLICATION FILED MAY 24, 1905.

963,362.

Patented July 5, 1910.



Witnesses:
Edgeworth Bruce
Wm. C. MacArthur

Inventor
Thomas A. Edison
 by *Frank L. Spier*
 Attorney.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, ORANGE, NEW JERSEY.

APPARATUS FOR RECORDING OR REPRODUCING SOUNDS.

963,362.

Specification of Letters Patent.

Patented July 5, 1910.

Application filed May 24, 1905. Serial No. 261,950.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, Orange, in the county of Essex and State of New Jersey, have invented certain Improvements in Apparatus for Recording or Reproducing Sounds, (Case B,) of which the following is a description.

My invention relates to various new and useful improvements in apparatus for recording or reproducing sounds, and my object is to provide an apparatus for the purpose which shall permit a more accurate recording of the sound waves free from waves or disturbances, due to the recording mechanism itself, and a more accurate reproduction of the same than is possible by methods and apparatus heretofore known.

In an application for Letters Patent filed on even date herewith, and relating to methods of recording or reproducing sounds, I have pointed out the cause or origin of the false, discordant and inharmonic sounds which are created within the recording mechanism, and which become recorded to affect the character of the reproduction.

With diaphragms as now made a thin plate, or a series of superposed plates, of greatly reduced diameter has been tightly clamped at the edge, so that any vibration must take place by the flexing or bending of the diaphragm itself. Such a diaphragm, moreover, acts practically as a reed and produces a note of its own, so that it vibrates sympathetically with certain notes within the range of music, and thereby produces inharmonic resultant tones which become recorded with the other sounds. Furthermore, such a diaphragm, in vibrating, vibrates locally so as to form a large number of nodes, as has been demonstrated by the production of the so-called Chaladni figures, and these vibratable local areas are also probably responsive to certain musical tones or overtones to result in the production of certain extraneous sounds, which become recorded and mar the reproduction. Moreover, such a diaphragm, owing to its clamped edges, vibrates with relative difficulty, and, hence, is not as sensitive as it should be; and, since it vibrates locally, the local vibrations are not communicated to the recording stylus, and, consequently, a proportionate loss of energy takes place to weaken the recorded sounds.

Notwithstanding the inherent lack of sensitiveness which is characteristic of ordinary diaphragms, the fact is that in the attempt to obviate the production of the inharmonic sounds referred to, it has been the practice to purposely further diminish the sensitiveness of the diaphragm to such an extent that the volume or strength of the inharmonic sounds is reduced so that they are not so prominent; but this practice has been ineffective for the purpose, and the diaphragms are so lacking in sensitiveness that the delicate overtones which accompany the fundamental tones, and which give to music its pleasing quality, are weakened in most cases so as to be practically inaudible, while distortion of the sound sought to be recorded is produced.

In correcting the faults which exist in diaphragms as now constructed, I have produced a diaphragm which is entirely free from any audible fundamental tone or overtone of its own, and which, therefore, does not vibrate sympathetically with any tones within the range of music. I thus prevent not only the distortion of the original sound waves, but I also prevent the production of inharmonic sounds, such as are produced with diaphragms as heretofore made. Furthermore, my improved diaphragm can be and is extremely sensitive, so as to accurately respond to and effect the recording of all fundamental tones as well as their overtones. Finally, with my improved diaphragm, inertia due to weight is reduced to a minimum, and, consequently, false vibration caused by overthrow and retardation is largely overcome, this being especially true in the case of vibrations of high frequency. I attain this result by employing a rigid diaphragm of a novel type, which, instead of vibrating in the usual way, vibrates as a whole, the entire displacement taking place at the edges, and I employ with that diaphragm at the periphery thereof an extension or continuation of soft pliable yielding material so as to operate practically as a hinge, the whole having no audible tone within the range of music. I have constructed diaphragms of extreme lightness, and, at the same time, so rigid that the loudest sounds ordinarily used in the art do not set any special local area in vibration sufficient to produce Chaladni figures, so that the whole vibrates or follows the sound waves with great accuracy by being forced.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming part of this specification and in which:

5 Figure 1, is a sectional view of a suitable recording apparatus embodying my present improvements, showing a flat corrugated diaphragm; Fig. 2, a similar view of a re-
10 producing apparatus embodying my improvements, showing a dished or concave diaphragm; Fig. 3, a similar view of a re-
cording apparatus, embodying my invention and showing a diaphragm that is both cor-
rugated and dished; Fig. 4, a plan view of
15 the diaphragm shown in Figs. 1 and 3, and Fig. 5, a plan view of the diaphragm shown in Fig. 2.

In all of the above views, corresponding parts are represented by the same numerals
20 of reference.

A diaphragm 1, is shown in Figs. 1 and 4 as being provided with concentric corrugations, made so deep that the diaphragm acts as a rigid body to sound waves, and
25 vibrates to and fro like a piston without bending or flexing at the center, as with ordinary diaphragms clamped at the edges. The rigidity of the diaphragm is such that if clamped at the edges in the usual way it
30 would not vibrate under the effect of sounds as ordinarily used in this art. Furthermore, the diaphragm is so rigid that it is free from local vibrations which with ordinary dia-
phragms produce Chaladni figures. The dia-
35 phragm shown in Figs. 2 and 5 is dished or scooped for the same purpose, but this is not quite so effective when deep corrugations are used. In any case, the dia-
phragm should be as light as possible, and
40 be stiff enough to vibrate as a rigid body. It will, therefore, be understood, that the diaphragms may be both dished and corrugated, as shown in Fig. 3, in order that metal of exceeding thinness can be used.
45 Preferably the diaphragm is made of very thin metallic magnesium, which is extremely light and very rigid when corrugated, particularly when both dished and corrugated,
50 and very thin sheets can be used—much thinner in fact than with glass diaphragms as now commonly employed. To this rigid piston-like diaphragm is secured around its outer edge a ring 2, preferably of soft rubber, which is held in place by shellac or
55 other cement, so as to form practically a yielding extension of the diaphragm, and which, when the diaphragm vibrates to and fro, vibrates practically as a hinge having a negligible resistance. The ring 2, may be
60 made of other materials than rubber, such as leather, paper, thin collodion, etc., but thin rubber tissue is preferable for obtaining great sensitiveness. This ring 2, is cement-
65 ed or otherwise secured without tension to any suitable arrangement of head or body

3, with which a speaking tube, listening tube or horn may be connected.

When used for recording purposes a foot 4, carrying a suitable recording stylus 5
(Figs. 1 and 3), is cemented or otherwise
70 secured to the diaphragm. When used with a reproducer, a reproducing stylus 6 (Fig. 2) is preferably pivoted to the usual float-
ing weight and connected to the diaphragm by a link in the usual way. 75

In order to take the thrust imposed by the rotation of the recording surface with respect to the recording stylus, I extend a link 7, between the foot 4, and an arm 8, depend-
80 ing from the head 3, said link being made preferably of wood so as to be very light, and having its vertical dimension greater than its transverse dimension, and of constantly varying section reduced to a very thin leaf at the end where it is secured to
85 the arm 8, whereby the formation of nodes will be prevented and the fundamental tone of the link be so grave as to be below the range of ordinary music, as I describe and claim in my application filed November 13,
90 1903, Serial No. 180,998. When the diaphragm vibrates it follows the very slight arc which the free end of the link describes, the yielding ring 2, permitting the dia-
phragm to move laterally to the desired
95 extent, so that there is no cramping in operation.

Since the diaphragm can vibrate only to and fro as a rigid body, like a piston, any yielding is necessarily confined to and takes
100 place entirely within the small free portion of the ring 2, extending between the diaphragm and the cement which holds the ring in place. This yielding section can have no audible local disturbing tone; and
105 hence, all of its movements, as well as those of the diaphragm, are forced, and the recorder is, therefore, caused to accurately follow the sound waves.

Since the action of the diaphragm is anal-
110 ogous to that of a piston subjected to pressure, first on one side and then on the other, it follows that any movements of the yielding section or bulging thereof beyond the movement of the diaphragm will diminish
115 the amplitude of the latter, and for this reason the yielding section should be very thin and the area very small. In practice, I increase the diameter of the rigid dia-
phragm to as great an extent in proportion
120 to the yielding material as possible, the latter being usually about six per cent. of the whole area. In this way I concentrate nearly the whole of the condensations and rarefactions of the sound waves upon the
125 diaphragms proper, so as to cause it to give the maximum response thereto, and prevent, to the greatest possible extent, loss of pressure due to yielding of the yielding section. 130

When a rigid diaphragm of my improved type is used in connection with reproducing apparatus a number of advantages are secured, as when employed with a recording apparatus. In the first place, owing to its extreme sensitiveness, the diaphragm accurately follows and responds to the recorded sounds; and, owing to its extreme lightness, inertia is reduced to a minimum so as to reduce the tendency of the diaphragm to leave the record, particularly when the recorded waves are very deep or of high frequency. Furthermore, the great lightness of the diaphragm materially reduces wear upon the recorded surface. In the next place, since the diaphragm is free from any fundamental tone or overtone of its own, it cannot respond sympathetically with any of the recorder sounds to thereby distort the reproduction and make it inharmonic. Finally, since the diaphragm is incapable of vibrating locally, the creation of extraneous sounds from that cause in the reproduction is also overcome.

While I have described my improved apparatus in connection with the recording and reproduction of sounds phonographically, and wherein the recorder forms, or the reproducer follows, a record of varying depth, it will be understood that the apparatus can be effectively utilized with machines of the gramophone type, wherein a zig-zag record groove is formed, it being only necessary in the latter case to connect the diaphragm with a recorder adapted to form, or with a reproducer adapted to follow, such a zig-zag record groove.

Having now described my invention what I claim as new therein and desire to secure by Letters Patent is as follows:

1. In apparatus for recording or reproducing sounds, the combination of a body and a very thin diaphragm formed of a light metal, said diaphragm being dished or concave, and provided with deep concentric corrugations, said diaphragm being connected to said body by a hinge of a material

having greater pliability than that of the diaphragm, substantially as set forth.

2. In apparatus for recording or reproducing sounds, the combination of a body and a very thin diaphragm formed of magnesium, said diaphragm being dished or concave, and provided with deep concentric corrugations, said diaphragm being connected to said body by a hinge of a material having greater pliability than that of the diaphragm, substantially as set forth.

3. In apparatus for recording or reproducing sounds, a very thin diaphragm formed of a light rigid and elastic metal, said diaphragm being dished or concave for practically its whole width, and provided throughout with deep concentric corrugations, substantially as set forth.

4. In apparatus for recording or reproducing sounds, the combination with a body and a diaphragm secured thereto by a hinge of yielding material so as to be capable of lateral movement, of a stylus connected to said diaphragm and a light rod anchored at one end and connected at its other end to said stylus for receiving the thrust thereof, said rod being so shaped as to give forth no audible tone in vibrating, substantially as set forth.

5. A diaphragm made of metallic magnesium and having a concave portion formed with concentric corrugations, substantially as set forth.

6. A diaphragm made of metallic magnesium and united to a circumferential section of small area composed of material having greater pliability than magnesium and which is adapted to operate as a hinge under the movements of the diaphragm, substantially as set forth.

This specification signed and witnessed this 20th day of May, 1905.

THOS. A. EDISON.

Witnesses:

FRANK L. DYER,
ANNA R. KLEHM.

W. A. CHAPMAN.
TALKING MACHINE ATTACHMENT.
APPLICATION FILED JULY 2, 1909.

963,515.

Patented July 5, 1910.

2 SHEETS—SHEET 1.

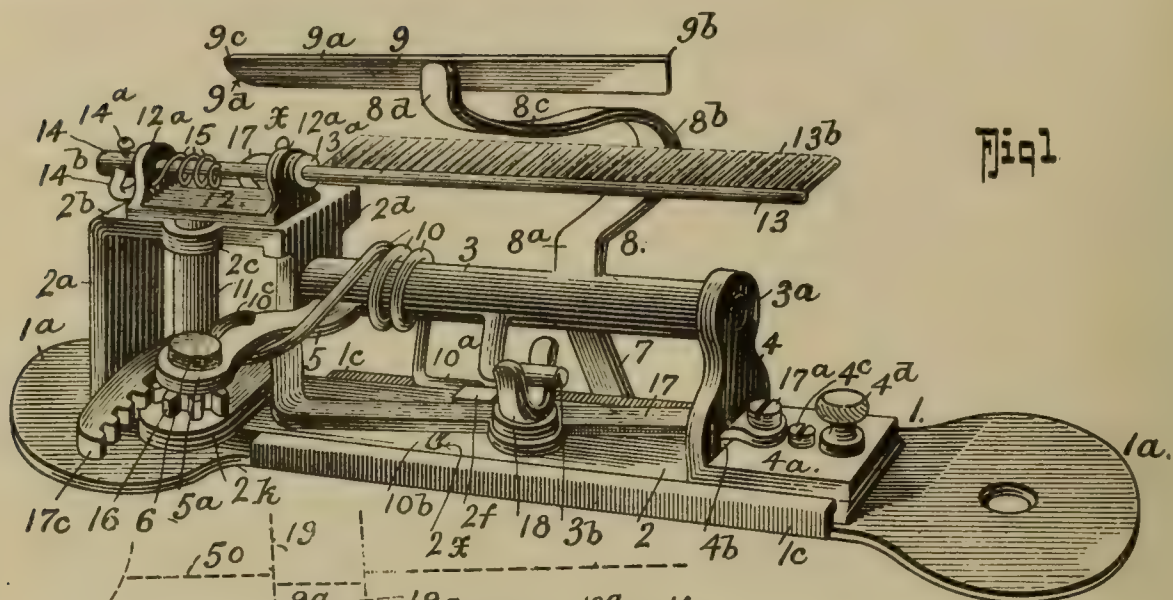


Fig. 1

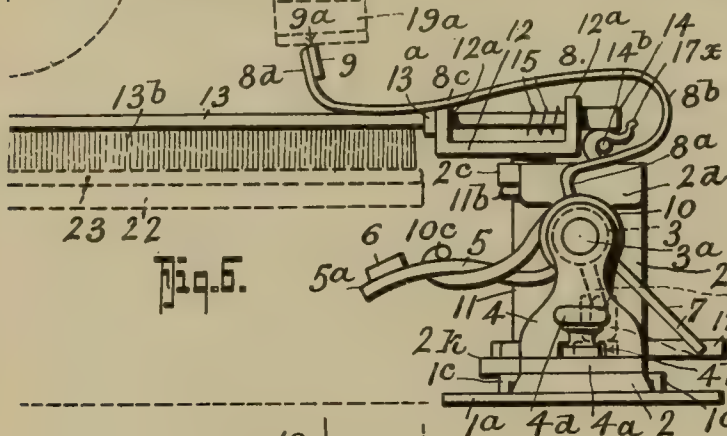


Fig. 5.

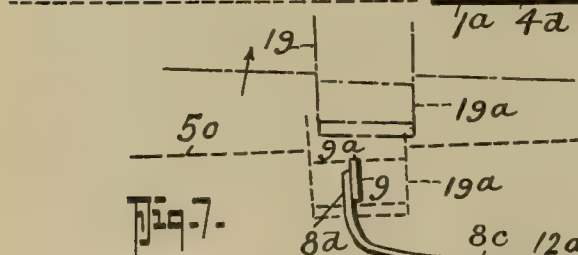
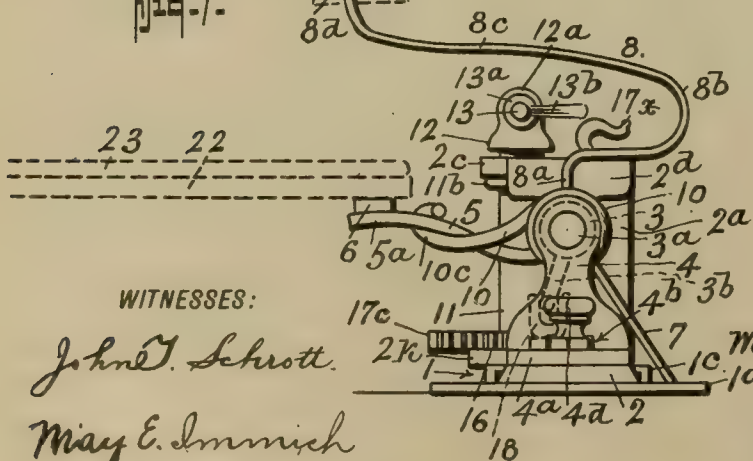


Fig. 7.



WITNESSES:

John T. Schrott.
May E. Immich

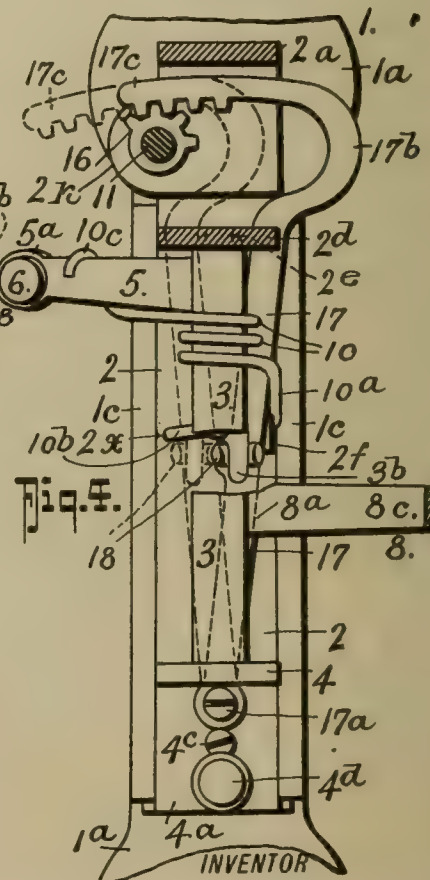
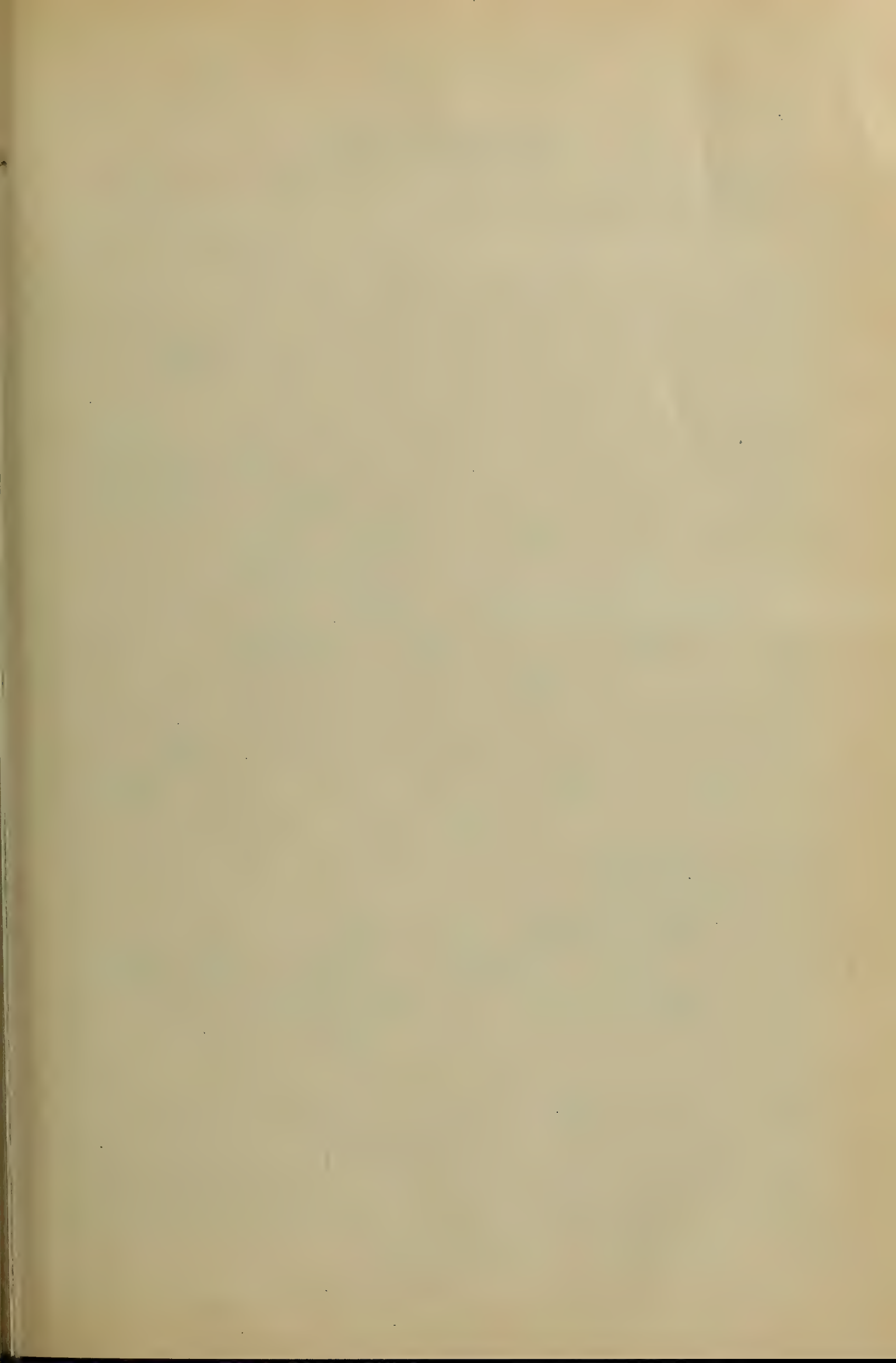


Fig. 4.

William Albert Chapman.

BY
Fred G. Detenich
ATTORNEYS.

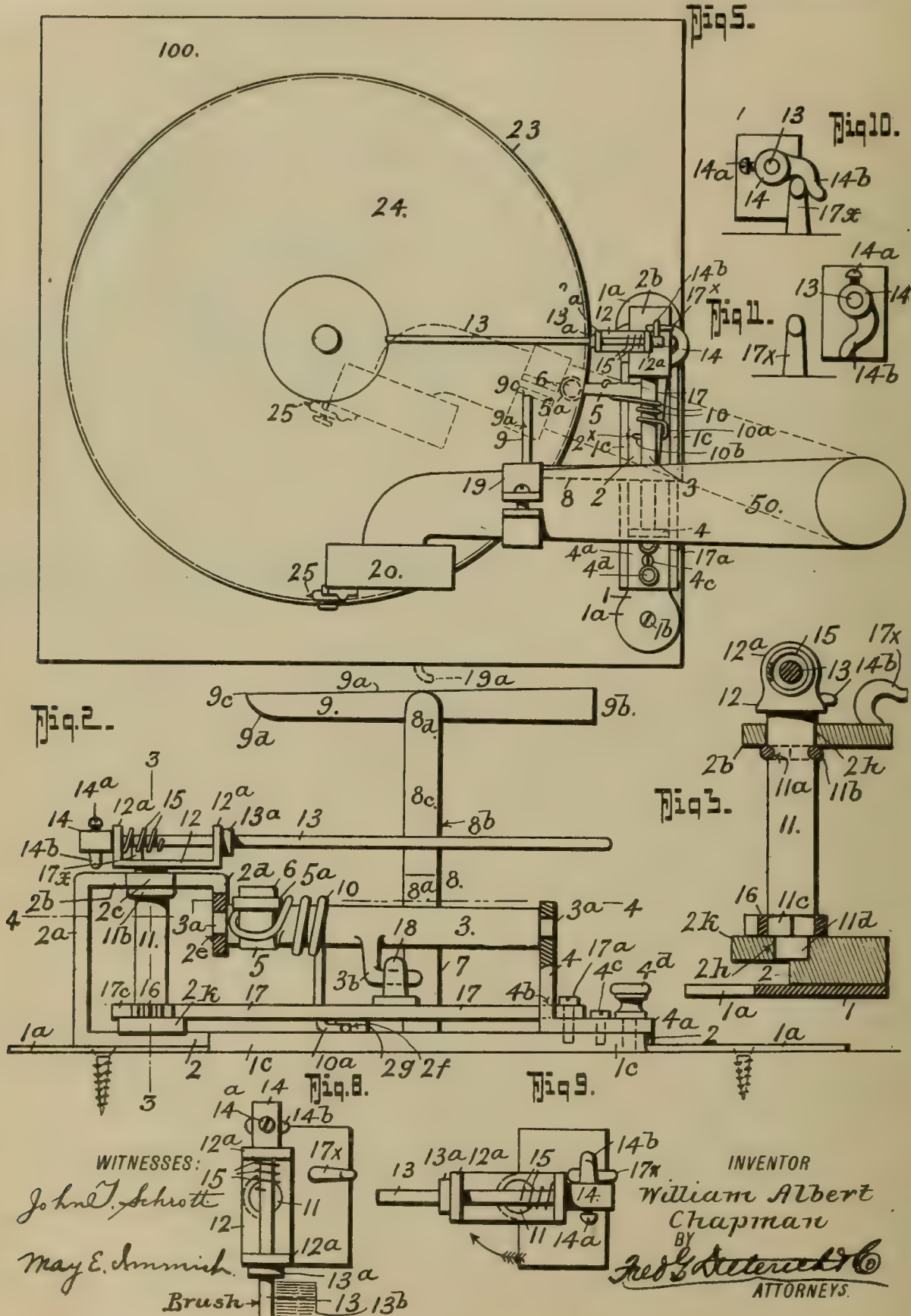


W. A. CHAPMAN.
TALKING MACHINE ATTACHMENT.
APPLICATION FILED JULY 2, 1909.

963,515.

Patented July 5, 1910.

2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

WILLIAM ALBERT CHAPMAN, OF SMITHVILLE, ARKANSAS.

TALKING-MACHINE ATTACHMENT.

963,515.

Specification of Letters Patent.

Patented July 5, 1910.

Application filed July 2, 1909. Serial No. 505,677.

To all whom it may concern:

Be it known that I, WILLIAM ALBERT CHAPMAN, residing at Smithville, in the county of Lawrence and State of Arkansas, have invented certain new and useful Improvements in Talking-Machine Attachments, of which the following is a specification.

My invention in an automatic controlling, feeding and cleaning device for attachment to talking machines of the disk type.

Attempts have heretofore been made to provide automatic devices to start and stop the machine by using an arm for effecting the tripping of trigger mechanisms at fixed points by impact, but such devices have not been found practicable in use, since in the designing of devices of that type apparently no regard was had to the wide divergence in area covered by the sound grooves of the different makes of records, nor even to the lesser variations occurring among records of the same manufacturer. Furthermore, in all such devices which have come to my attention, no means are provided for adjusting the movement of the sound box carrying arm and stylus with relation to the width of the record. In the devices above referred to the liability of the needle to jump from one record groove to another is increased and no means is provided whereby the machine, in an emergency, may be stopped by hand.

It is therefore one of the objects of my invention to provide a device free from the foregoing defects.

It is also known that a considerable weight, existant in the arm of the horn, and the attached sound box of the machine, is supported on the point of the needle, which, in consequence, is forced into the material of the record, thereby developing a much greater degree of friction than is desirable in the attainment of the best results. This excess weight, not only absorbs much of the power of the driving mechanism, but is also an active agent of destruction in breaking down the wall of the sound grooves as well as a prolific source of discordant sound that seriously impair the production of harmonic sounds. It is further known, that the inner wall of the sound groove is the one most vital in reproduction, and that with use, where the sound groove alone forms both guide and retainer of the needle point, there results an irregular widening of the groove

which admits of play of the needle point and its jumping from one groove to another already traversed under the ever present tendency of the needle, under centrifugal force, to drift toward the outer or peripheral edge of the disk.

It is therefore a further object of my invention to counter-balance the weight of the sound box carrying arm and its attached parts and to utilize a part of such weight to overcome the centrifugal force that tends to drift the needle toward the periphery of the disk, thereby overcoming the objections above noted. It has also been found in practice that where means have been provided for cleaning the record disk such means have usually been applied to the sound box and therefore add to the weight of the sound box, increasing the tendency of the needle to jump from one groove to another and requiring special fittings to adapt the cleaning devices to the sound box, objections which my device is designed to eliminate.

More briefly then it is the object of my invention to provide a device free from the aforesaid defects and whereby the acts of starting and stopping of the machine and the cleaning of the disk are rendered automatic in their operation, yet if need be, operative by hand.

My invention also has for its object to accomplish these acts without shock or jar to the driving mechanism and the other operative parts of the talking machine, and to cause the various acts of the various parts of the device to be sequential in their operation as well as automatic so that they go through a definite cycle of operations from the moment the machine is set in operation until it stops.

A further object of this invention is to provide an attachment of the character stated wherein all operations are subject to and have their operative beginning in the act of placing the needle point in the sound groove of the record. Therefore, the device will go through its cycle of sequential operations, terminating in the act which stops the machine.

With other objects in view which will be hereinafter fully apparent to those skilled in the art, the invention also embodies those novel details of construction, combination, arrangement and operation of parts, all of

which will be first fully described, then be specifically pointed out in the appended claims, and illustrated in the accompanying drawings, in which:

5 Figure 1, is a perspective view of my invention in its normal or inoperative position. Fig. 2, is a front elevation thereof. Fig. 3, is a section on the line 3—3 of Fig. 2. Fig. 4, is a horizontal section on the line 4—4 of Fig. 2, a part of the rock shaft being
10 broken away to more clearly show the parts beneath. Fig. 5, is a top plan view illustrating the application of the invention. Fig. 6, is an end elevation showing the position of the parts when the record is being
15 played. Fig. 7, is a similar view showing the position of the arm (in dotted lines) at the end of the record, and in its raised position (in dot and dash lines) with the parts
20 of the attachment in their inoperative or normal position. Figs. 8 and 9, are detail views illustrating the manner of turning the brush in its bearings. Figs. 10 and 11, are diagrammatic views hereinafter referred to.

25 Referring now to the accompanying drawings, in which like letters and numerals of reference indicate like parts in all of the figures, 1 represents the base plate which is provided with apertured ears 1^a at its ends,
30 through the medium of which it may be secured by screws 1^b to the bed of a talking machine 100. The base 1 has upturned and inturned flanges 1^c which form a channel in which the carriage 2 is longitudinally ad-
35 justable. The carriage 2 has one end bent upwardly at right angles to the plane of the carriage, as at 2^a, and backwardly as at 2^b, parallel with the base of the carriage 2, the end of the parallel portion 2^b being down-
40 wardly turned as at 2^d parallel with the upturned portion 2^a, for a purpose presently to appear. The upper section 2^b of the carriage 2 has a forwardly extended bearing 2^c for a shaft 11, hereinafter again referred
45 to. The downwardly projected member 2^d of the carriage is apertured as at 2^e to receive one of the bearings 3^a of a rock shaft 3 whose other bearing 3^a is held in an aperture in a bracket 4, whose base 4^a is screwed at 4^c
50 to the carriage 2, the standard portion of the bracket 4 being slotted as at 4^b to permit passage of the rack carrying lever 17, hereinafter again referred to. A set screw 4^d passes through the base 4^a of the bracket 4
55 and through the carriage 2 to secure it in its adjusted positions to the base 1.

5 5 designates the brake arm which is formed with the rock shaft 3 and has the outer end 5^a cupped to receive the brake pad
60 6 of leather, or other suitable material. Projecting downwardly from the rock shaft 3 is a finger 7, which, when the parts are in their normal or inoperative position, rests against the rear side of the base plate 1^a and forms a

stop to limit the rotary movement of the 65 shaft 3 in one direction.

8 is an arm formed with the shaft 3 and for a portion of its length projecting upwardly therefrom as at 8^a, and then bent into a loop as at 8^b and terminating in a forwardly projecting curved portion 8^c, the end 8^d of which supports a slide bar 9 which is
70 formed integral with the arm 8, in any desired manner. The slide bar 9 is held with its longitudinal axis parallel to that of the rock shaft 3 and that of the base 1^a while the upper edge 9^a of the bar 9 is beveled slightly from the end 9^b to the end 9^c, for a purpose hereinafter made clear, while the end 9^c is undercut as at 9^d for a purpose also
75 hereinafter more fully apparent. A coil spring 10 encircles the shaft 3 and has one of its ends 10^c hooked around the arm 5 while its other end is bent as at 10^a to underlap a lug 2^f which is formed with the base
80 2 and is undercut as at 2^g to receive the spring 10, while the end 10^b of such spring is downwardly bent and passed into an aperture 2^h of the carriage 2.

11 is the shaft which is directly mounted 90 in bearing apertures 2^h in the upper plate 2^b of the carriage 2, and a bearing aperture 2^h in an integrally formed projection 2^k of the plate 2. The shaft 11 has a groove 11^a beneath the plate 2^b in which a split ring 11^b
95 is sprung to prevent the shaft 11 "riding up" in its bearings. At its lower end the shaft 11 is squared, as at 11^c, to receive a mutilated pinion 16 and beneath the squared portion 11^c the shaft is again rounded as at 11^d to enter the bearing 2^h in the bracket plate 2^k of the carriage 2, see Fig. 3.

Mounted on the upper end of the shaft 11, above the plate 2^d is a turn-table 12 which has lugs 12^a apertured to receive the 105 rod 13 of a brush 13^b which rod is held from longitudinal movement by a collar 13^a and a second collar 14 that is secured to the rod 13 by a set screw 14^a, as shown in Figs. 1, 8 and 9 of the drawings. A coil spring 110 15 is wound around the rod 13 between the lugs 12^a and has one end passed through an aperture in one of the lugs 12^a and the other end passed through an aperture in the rod 13, whereby such spring will normally hold
115 the brush 13^b in a horizontal position.

17^x is a cam projection formed on the upper portion of the plate 2^b to coöperate with a similar cam projection 14^b on the collar 14 (see Figs. 8, 9, 10 and 11) to turn the 120 rod 13 and bring the brush 13^b in a vertical plane, when such cam sections 17^x and 14^b are brought into contact with one another.

The bar 17, hereinbefore referred to, is projected through the slot 4^b in the bracket 4 and pivoted at 17^a to the base 4^a of such bracket, while the free end of the rack bar 17 is looped or curved at 17^b and provided

with a toothed arc segment 17^c to coöperate with the pinion 16 on the shaft 11, in a manner hereinafter explained. Swivelly connected to the bar 17 is a forked member 5 18 in which the angle finger 3^b of the shaft 3 plays, the finger 3^b lying in a direction parallel to the shaft 3.

19 is a collar secured to the horn arm 50 of the machine and having a bearing shoe portion 19^a to ride on the slide bar 9 in a manner hereinafter explained.

In the drawings the turn-table of the talking machine is designated by the reference character 22, and the record disk by the reference numeral 23, the record area of sound grooves being indicated by the number 24.

Having thus described the general construction of my invention, the operation is substantially as follows:

20 Operation: The operator, having attached the device to his talking machine, adjusts the carriage 2 through the medium of the set screw 4^a to properly position the bar 9, so that when the needle 25 is placed in the 25 outer groove of the sound record 24, as shown in Fig. 5 of the drawings, the clip 19^a will rest on the bar 9 adjacent to the end 9^b thereof and so that when the needle 25 is in the innermost sound groove (see dotted 30 lines in Fig. 5) the shoe 19^a of the clip 19 will just leave the bar 9 at the end 9^c. Having thus adjusted the device, the set screw 9^a is tightened down. Now assume that it is desired to play a piece, the operator places 35 the needle 25 in the outer sound groove 24 of the disk 23. Performing this act causes the shoe 19^a of the clip 19 to engage the slide bar 9, which in turn depresses such bar 9 from the position shown in Fig. 7 to that 40 shown in Fig. 6, thereby rocking the rock shaft 3 and releasing the brake device from contact with the underside of the turn-table 22. Rocking the shaft 3 in this manner causes the angle finger 3^b to rock the rack 45 bar 17 from the position shown in dotted lines in Fig. 4 to the position shown in full lines in such figure, thereby turning the shaft 11 through an angle of 90 degrees to bring the brush 13^b over the disk 23 into 50 the position shown in Fig. 5. Swinging the brush from the position shown in Figs. 1 and 7 to the position shown in Figs. 5 and 6 causes the cam member 14^b to engage member 17^x and turn the brush rod 13 through 55 an angle of 90 degrees to bring the brush 13^b from the horizontal position, shown in Figs. 1 and 7, to the vertical position, indicated in Figs. 5 and 6, thereby bringing such brush into contact with the record face 60 of the disk 23. The act of placing the needle 25 in the outer sound groove, as before stated, releases the brake from beneath the turn-table 22, and this permits the motor to turn the turn-table, in the usual man-

ner, and as the needle 25 is in contact with 65 the sound grooves 24 of the disk 23, the record will be played.

By virtue of the upper face 9^a of the slide bar 9, being beveled from the end 9^b toward the end 9^c the weight of the arm 50 and its 70 carried parts (which weight is largely counterbalanced by the spring 10) serves to tend to cause the arm 50 to slide down the runway, from end 9^b to end 9^c, and thus maintain the needle 25 in contact with the inner 75 wall of the sound groove of the record disk 23. As the needle 25 approaches the innermost sound groove, the shoe 19^a will leave the bar 9 and thus permit the spring 10 to restore the shaft 3 to its initial position with the 80 brake device in contact with the underside of the turn-table 22 and the bar 9 elevated. Restoring the shaft 3 to its initial position, the finger will reverse the direction of movement in the rack bar 17 which thereby re- 85 verses the rotation of the shaft 11 and brings the brush arm 13 from the position shown in Figs. 5 and 6 back to the position shown in Figs. 1, 2, and 7 of the drawings, and at the same time the cam 14^b will dis- 90 engage the cam 17^x and permit the spring 15 to bring the brush rod 13 back to its initial position, as shown in Figs. 1, 2 and 7 of the drawings, thus the talking machine will be automatically stopped as the needle 95 25 reaches the end of the record and the working parts of my invention will be restored to their initial positions. In order to lessen possible friction between the end 9^c of the bar 9 and the shoe 19^a, when the said 100 shoe leaves the bar 9, I bevel the under surface of the bar 9 at the end 9^c, as indicated at 9^d, and above referred to. The relative operation of the cams 14^b and 17 will be clearly understood by reference to 105 Figs. 8, 9, 10 and 11 of the drawings. As the brush 13^b is restored to its initial position after having been swung over the disk 23 it will be automatically cleaned by engagement with the arm 8 as it enters the 110 loop portion 8^b thereof.

From the foregoing description taken in connection with the accompanying drawings it is thought that the complete construction and operation of my invention will be readily 115 apparent to those skilled in the art, and I wish to call attention to the fact that my invention embodies certain peculiar characteristics, namely,—1st, the acts of starting and stopping are adjustable with relation 120 to one another and to the width of the grooved portion of the record and are uniformly and positively exhibited without shock or jar to the driving mechanism; 2nd, that all adjustments are made by one simple act, 125 (through the adjustment of the carriage 2 by moving such carriage when the set screw 4^a is loosened), and the operative period of

the device is made subjective to the width of the grooved portion of the record and the stoppage of the machine is governed by the end of such grooved portion of the record; 3rd, means are provided whereby the needle is made to bear with a fixed and uniform pressure against the inner side of the sound groove and is thus guided through the volute groovings, the wall of which governs the rate of progression of the needle in the direction transverse to that of the length of the grooves and the result of the needle being drifted toward the periphery of the sound disk by centrifugal action is thereby compensated; 4th, that the excessive weight of the horn arm and sound reproducer heretofore supported upon the point of the needle is directly utilized as the operative force of this device and this removal of weight is effected by utilizing the same as the power for compressing a spring whereby a balance is had between the weight and the spring, the weight being the governing power; 5th, that by neutralizing the weight, the friction between the needle point and the record is reduced and thus the labor of the motor is reduced and smoother action had with greater life given the record; 6th, the province of the spring 10 is two-fold, 1st; it forces the friction or brake block into operative contact with the turntable of the machine at the proper time to stop the machine and hold it inoperative until the weight of the horn arm is again imposed upon the runway bar, and 2nd; it gives resilient support to the said arm of the horn and sound box; 7th, the arm of the machine may be raised, lowered or swung around without in any way affecting the device, the machine only becoming operative when the needle point is placed in one of the sound grooves; 8th, in order to stop the machine while operating, it is only necessary to raise the arm of the horn and thus permit the spring 10 to perform its reversing function and apply the brake.

From the foregoing description it is thought the operation and advantages of my invention will be readily apparent to those skilled in the art to which it appertains.

What I claim is:

1. In a talking machine of the disk type, resilient means for supporting the horn and sound box arm and simultaneously tending to move it toward the center of the record disk.

2. An attachment for talking machines of the disk type comprising a brake applying means and a disk cleaning means, and means governed by the weight of the horn arm for controlling the action of said brake applying means and said cleaning means.

3. An attachment for talking machines of

the disk type comprising a brake applying means and a disk cleaning means, and means governed by the weight of the horn arm for controlling the action of said brake applying means and said cleaning means, and means for simultaneously tending to move said horn arm with the sound box needle toward the inner wall of the sound groove of the record disk.

4. In an attachment for talking machines of the disk type, a brake applying means, a cleaning means controlled by the movement of the brake applying means, a power supplying device connected with said brake applying means for applying the brake, and means carried by said brake applying means for engaging the horn arm of the talking machine in virtue of which the weight of said arm will store power into said power applying means and simultaneously release said brake and operate said cleaning means.

5. In an attachment for talking machines, a brake applying means, means normally tending to operate said brake, combined with means operated by the weight of the horn arm for releasing said brake, and means for adjusting the time of action of said weight of said horn arm.

6. In an attachment for talking machines of the disk type, a brake applying means, means normally tending to operate said brake, combined with means operated by the weight of the horn arm for releasing said brake, means for adjusting the time of action of the weight of said horn arm, and means normally tending to move said horn arm in one direction to maintain the stylus needle in contact with the inner wall of the sound groove.

7. In an attachment for talking machines of the disk type, a brake applying means, means normally tending to operate said brake, combined with means operated by the weight of the horn arm for releasing said brake, means for adjusting the time of action of the weight of said horn arm, together with a disk cleaning means and operative connections between said disk cleaning means and said brake applying means for moving the disk cleaning means into and out of operative position.

8. In an attachment for talking machines of the disk type, a brake applying means, means normally tending to operate said brake, combined with means operated by the weight of the horn arm for releasing said brake, means for adjusting the time of action of the weight of said horn arm, means normally tending to move said horn arm in one direction to maintain the stylus needle in contact with the inner wall of said groove, together with a disk cleaning means and operative connections between said disk cleaning means and said brake applying

means for moving the disk cleaning means into and out of operative position.

9. An attachment for a talking machine of the disk type, comprising a base plate, a carriage adjustable thereon, a brake mechanism mounted on said carriage, and means normally tending to apply the brake of said brake mechanism, means for limiting action of said applying means in one direction, and means coöperatively connecting said brake mechanism with the horn arm of a talking machine in virtue of which the weight of said arm will overcome the action of the brake applying means and release said brake.

10. An attachment for talking machines comprising a base plate, a carriage adjustable thereon, a brake mechanism mounted in said carriage, means normally tending to apply the brake of said brake mechanism, means for limiting the action of said applying means in one direction, means coöperatively connecting said brake mechanism with the horn arm of a talking machine in virtue of which the weight of said arm will overcome the action of the brake applying means and release said brake, a cleaning brush pivotally mounted on said carriage, and means coöperatively connecting said brush with said brake mechanism for moving said brush into and out of operative position.

11. An attachment for talking machines of the disk type, comprising a base plate, a carriage adjustable thereon, a brake mechanism mounted in said carriage, and means normally tending to apply the brake of said brake mechanism, means for limiting the action of said applying means in one direction, means coöperatively connecting said brake mechanism with the horn arm of a talking machine in virtue of which the weight of said arm will overcome the action of the brake applying means and release said brake, a cleaning mechanism also mounted on said carriage comprising a pivotally mounted brush, connections between said brush and said brake mechanism for moving said brush from one position to another, and other means for turning said brush on its pivot to bring it into and out of engagement with a record disk.

12. An attachment for talking machines of the disk type, comprising a base and a carriage mounted thereon, said carriage having bearings, a rock shaft mounted in bearings, a brake arm carried by said rock shaft and having a brake shoe, means normally tending to turn said shaft in one direction, means for limiting the turning of said rock shaft in such direction, and another means for coöperatively connecting said rock shaft with the horn arm of the talking machine in virtue of which when the horn arm is in position with the stylus or needle operatively

placed in the record groove, the weight of said arm will turn said rock shaft in an opposite direction to release said brake.

13. An attachment for talking machines of the disk type, comprising a base plate, a carriage adjustable thereon, a brake mechanism mounted on said carriage, and means normally tending to apply the brake of said brake mechanism, means for limiting the action of said applying means in one direction, means coöperatively connecting said brake mechanism with the horn arm of a talking machine, in virtue of which the weight of said arm will overcome the action of the brake applying means and release said brake, a cleaning mechanism also mounted on said carriage comprising a turn-table mounted on said carriage and having bearings, a brush carried by said turn-table, and means coöperatively connecting said rock shaft with said turn-table in virtue of which the movement of the rock shaft will be applied to said turn-table to turn the same.

14. An attachment for talking machines of the disk type, comprising a base and a carriage mounted thereon, said carriage having bearings, a rock shaft mounted in said bearings, a brake arm carried by said rock shaft and having a brake shoe, means normally tending to turn said shaft in one direction, means for limiting the turning of said rock shaft in such direction, another means for coöperatively connecting said rock shaft with the horn arm of the talking machine in virtue of which when the horn arm is in position with the stylus or needle operatively placed in the record groove, the weight of said arm will turn said rock shaft in an opposite direction to release said brake, a turn-table mounted on said carriage and having bearings, a brush carried by said turn-table, and means coöperatively connecting said rock shaft with said turn-table in virtue of which the movement of the rock shaft will be applied to said turn-table to turn the same.

15. An attachment for talking machines of the disk type, comprising a base plate, a carriage adjustable thereon, a brake mechanism mounted on said carriage, and means normally tending to apply the brake of said brake mechanism, means for limiting the action of said applying means in one direction, means coöperatively connecting said brake mechanism with the horn arm of a talking machine, in virtue of which the weight of said arm will overcome the action of the brake applying means and release said brake, a cleaning mechanism also mounted on said carriage comprising a turn-table mounted on said carriage and having bearings, a brush carried by said turn-table, means coöperatively connecting said rock shaft with said turn-table in virtue of which the movement of the rock shaft will be applied to said turn-table to turn the same.

plied to said turn-table to turn the same, and means for turning said brush in its bearings in said turn-table as said turn-table is moved from one position to another.

5 16. An attachment for talking machines of the disk type, comprising a base and a carriage mounted thereon, said carriage having bearings, a rock shaft mounted in said bearings, a brake arm carried by said
10 rock shaft and having a brake shoe, means normally tending to turn said shaft in one direction, means for limiting the turning of said rock shaft in such direction, another means for coöperatively connecting said
15 rock shaft with the horn arm of the talking machine in virtue of which when the horn arm is in position with the stylus or needle operatively placed in the record groove, the weight of said arm will turn said rock shaft
20 in an opposite direction to release said brake, a turn-table mounted on said carriage and having bearings, a brush carried by said turn-table, means coöperatively connecting said rock shaft with said turn-
25 table in virtue of which the movement of the rock shaft will be applied to said turn-table to turn the same, and devices connecting said turn-table and said brush for turning said brush in its bearings in said
30 turn-table as said turn-table is moved from one position to another.

17. An attachment for talking machines of the disk type, comprising a base plate and a carriage adjustably mounted thereon,
35 said carriage having bearings, a rock shaft mounted in said bearings and having a brake carrying arm, a spring normally tending to turn said rock shaft in one direction, means carried by the
40 rock shaft for engaging said base to limit the turning movement of said rock shaft, an arm carried by said rock shaft, a slide bar carried by said arm, a second shaft mounted in bearings in said carriage, a turn-
45 table carried by said second shaft and having bearing ears, a brush having a rod portion mounted in said bearing ears, and means normally holding said brush in a definite position, a rack bar pivoted in said
50 carriage and having a rack segment, a pinion on said second shaft for engaging said rack segment, operative connection between said rock shaft and said rack bar in virtue of which the movement of the rock shaft
55 will be imparted to said bar to turn said second shaft, and means for turning said brush rod in its bearings as said second shaft is turned from one position to another, and an attachment for the horn arm of a talking
60 machine to engage said slide bar to operatively connect said horn arm with said slide bar at times.

18. An attachment for talking machines of the disk type wherein is provided a ver-
65 tically and laterally movable horn arm, com-

prising a brake applying means and a disk cleaning means, and means governed by the weight of the horn arm for moving the disk cleaning means into and out of operative relation to the disk and for controlling the
70 action of said brake applying means.

19. In an attachment for talking machines of the disk type having vertically movable horn arms, means for counteracting the ac-
tion of centrifugal force on the needle, said
75 means comprising an inclined plane and means governed by the weight of said horn arm and coöperating with said inclined plane to move said needle in a direction opposite to that in which the centrifugal
80 force acts.

20. An attachment for talking machines of the disk type, comprising an inwardly projecting brake applying means, and means controlled by the weight of the horn arm
85 for governing the action of said brake applying means, and means continuously acting on said horn arm tending to move it with the stylus toward the center of the record disk.
90

21. An attachment for talking machines of the disk type, comprising a rotative brake applying means, means controlled by the weight of the horn arm for governing the action of said brake applying means, means
95 continuously acting on said horn arm tending to move it with the stylus toward the center of the record disk.

22. An attachment for talking machines of the disk type, comprising an inwardly
100 projecting rotative brake applying means, means controlled by the weight of the horn arm for governing the action of said brake applying means, and means continuously acting on said horn arm tending to move
105 it with the stylus toward the center of the record disk.

23. An attachment for talking machines of the disk type, a brake applying means, a disk cleaning means, and means governed
110 by the weight of the horn arm for simultaneously releasing the brake applying means and projecting the disk cleaning means into position over the disk.

24. An attachment for talking machines
115 of the disk type, a brake applying means, a disk cleaning means, means governed by the weight of the horn arm for simultaneously releasing the brake applying means and projecting the disk cleaning means into
120 position over the disk, and for simultaneously permitting said brake applying means to come into operation and for removing said disk cleaning means from over the disk.

25. In a talking machine of the disk type
125 having a pivoted horn arm for movement in a vertical plane, means for counteracting the action of centrifugal force on the needle comprising an inclined plane in operative engagement with the horn arm to cause said
130

horn arm to drift in a direction opposite to that in which the centrifugal force acts.

26. In a talking machine of the disk type wherein is included a horn arm having horizontal and vertical movement, means for simultaneously resiliently supporting said horn arm and causing it to drift and con-

tinuously move the sound box toward the center of the record disk.

WILLIAM ALBERT CHAPMAN.

Witnesses:

S. A. D. JONES,
OTTIS HILL.

L. T. HAILE.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED APR. 8, 1909.

963,546.

Patented July 5, 1910.

Fig. 1.

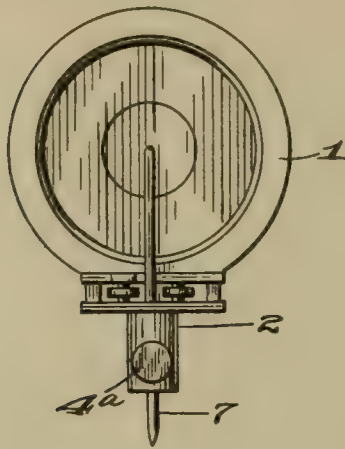


Fig. 2.

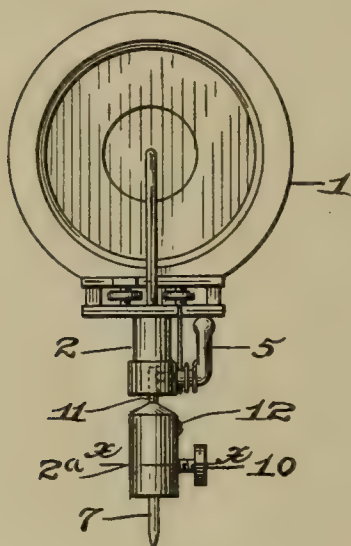


Fig. 3.



Fig. 4.

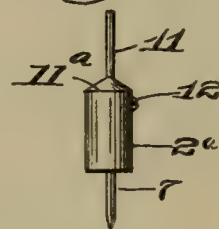


Fig. 5.

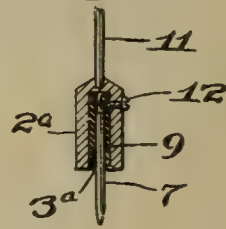


Fig. 6.

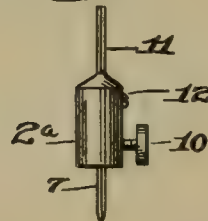
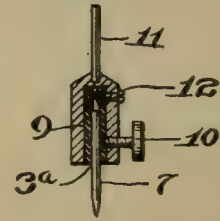


Fig. 7.



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UNITED STATES PATENT OFFICE.

LUTHER T. HAILE, OF PHILADELPHIA, PENNSYLVANIA.

SOUND-BOX FOR TALKING-MACHINES.

963,546.

Specification of Letters Patent.

Patented July 5, 1910.

Application filed April 8, 1909. Serial No. 488,546.

To all whom it may concern:

Be it known that I, LUTHER T. HAILE, citizen of the United States, residing in the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Sound-Boxes for Talking-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to sound-boxes for talking machines and has for its object the provision of means supplemental to and operatively detachable and replaceable from and to the usual needle-holder of the sound-box, without interference with the usual function and capacity of the latter to retain a needle removably in its longitudinal aperture by any known means; my invented means imparting to the sound-box and its needle-holder an additional function, namely increasing its capacity to produce loud or soft tones from the same stylus or needle. Such result has never been heretofore effected, by any needle-holding means.

Heretofore to accomplish the ultimate result stated, it was and is necessary, when desiring to produce both loud and soft sound waves from the diaphragm of the sound-box to use two well known types of needles, namely a "hard" needle, so-called, in the needle holder, for production of loud sound waves or tones, and then removing the former and substituting a "soft" needle, so-called, in the needle holder, and vice versa, according to the result desired. The former kind of needles are comparatively cheap and most largely used, while the latter are relatively expensive. My invention increases the capacity and functions of the known sound-box and needle-holder, by enabling it to perform, with a common "hard" needle the function of a "soft" needle as well, at the pleasure of the operator, and incidental thereto it also increases the range of use of the primary needle holder by enabling the operator to use specific shapes, such as triangular in cross-section or otherwise, of needles, the supplemental needle-holder having a bushed needle-holding aperture adapted to that end, not as its primary purpose but, as before stated, an incidental advantageous capacity; and I might further properly speak of another incidental advantage, namely, that it enlarges the useful life of any "disk" record because taking up and elim-

inating the scratchy noises produced by an ordinary "hard" needle on such a record, the grooves of which also quickly become worn by abrasion from such a needle; in other words by the use of any supplemental and detachable needle-holder with the usual primary needle-holder of a sound-box, not only is the necessity for a "soft" needle to produce soft tonal effects entirely eliminated, but the "hard" needle is given the capacity to produce its usual "loud" tones when desired, to produce "soft" tones when desired, and to produce the "soft" tones with a materially lessened degree of abrasive effect on the record.

In the drawings illustrating my invention, Figure 1 is a top view of a usual type of sound-box and needle-holder, on which my improvement is adapted to be employed; Fig. 2 is a like view, of the former and of my improvement detachably attached thereto; Fig. 3 is a section on the line $x-x$ of Fig. 2. Figs. 4 and 5 are elevation and section of the supplemental needle-holder of Fig. 2 detached from the primary needle-holder of Fig. 1, and Figs. 6 and 7 are like views as Figs. 4 and 5, but with the addition of a tone-modifying screw.

Referring now to said drawings, 1 indicates a sound-box of known construction, for a talking machine, and consisting, speaking generally, of a circular frame, supporting a diaphragm and adjunctive parts not necessary to refer to, except that it is provided with a needle-holder 2, and which consists of a short metallic cylinder which is longitudinally bored to permit the insertion therein of the heel end of the needle 7; and means to hold it removably therein when it is desired to remove same and insert a new one.

As the vibratory sound-waves from the diaphragm of the sound-box are transmitted through the needle, it is obvious that the physical contact of the spring-controlled holding-pin therewith has objectionable effects aside from its existence as an added mechanical element, and moreover in sound-boxes employing such character of holding means, a "soft" needle has to be substituted for the usual "hard" needle when a sound-record is played producing sound-waves whose tone require a "soft" needle, and which would be very ineffectively produced by the use of the usual "hard" needle.

In my device, operatively employed, as shown in Fig. 2, said usual holding means, 4^a

does not contact with the needle at all, but with the shank or spindle 11 on the apex of the supplemental needle-holder, and, as hereinafter described I employ no direct mechanical needle-holding means at all, but in lieu thereof provide the longitudinal aperture 3^a of the supplemental holder (Fig. 5) with a bushing of resilient material 9 which performs the double function of detachably holding the needle by frictional contact, resiliently applied, and converts the sound wave created by the needle from hard to soft.

I will now describe its construction in detail by reference to the drawings:

Without altering the known form of needle-holder 2, shown in Fig. 1 and top part of Fig. 2, but preserving and retaining the same exactly as it is, both as to construction, mode of operation and function, as a necessary adjunctive element of my improvement thereon, I add a supplemental and duplicate needle-holder, indicated at 2^a in Fig. 2 and shown in detached elevation in Figs. 4 to 7, constructed in such manner as to be detachably removable and replaceable, from and in the primary and usual needle-holder 2, in substitution, when desired, for the stylus or needle 7 removably supported operatively therein as usual. This result is effected by making the body portion 2^a quite similar, as a short cylindrical body, to the usual holder body 2, and providing it with a longitudinal aperture 3^a, which latter is lined with a bushing 9 shown as a tubular body of compressible and resilient material, such as soft vulcanized rubber, whereby to create a resilient frictional holding contact with the shank end of the inserted needle 7; and to that end the relative diametric proportion of the aperture 3^a and bushing 9 to each other and to the shank end of a needle is accordingly, while the length of both 3^a and 9 are such as to accommodate fully the holding portion or shank of the needle which is about two-thirds its whole length. If desired, the bushing may be mechanically held in place by a small screw 12. But the resilient needle-holding function of the bushing is not its sole function, an additional and primary function being that it modifies or softens the sound-vibrations passing through the needle to the diaphragm of the sound-box; and even this effect in turn may be governed and regulated to a nicety, enabling the player to graduate and change the gradations of tone-effect, of even an ordinary hard needle, if desired, by the employment of a set screw 10 so mounted in the holder-body 2^a that its point can be brought to compress the wall of the resilient bushing against the shank of the needle, giving firmer hold and stronger vibration without metallic contact; and this in addition to the function of the supplemental and de-

tachable character of the improvement in eliminating the otherwise necessary resort to a plurality of different kinds of needles for such purpose, and indeed with greater certainty of producing the exact tone effect desired.

Another feature of importance, due to the constructional character of the body 2^a of the supplemental holder is that its exterior top is made with an annular bevel, indicated at 11^a, Fig. 4, on the apex of which is a stem or spindle 11 adapted to be inserted, (like a needle 7) in the usual longitudinal needle-holding aperture of the primary or usual needle-holder 2 (Fig. 1) as indicated by the dotted lines in Fig. 2. The function of the annularly beveled apex 11^a on the supplemental holder is that there can be no contact thereof with the flat basal end of the primary needle-holder 2, and hence no chance for a rattling contact, due to vibration, which might occur if both had flat surfaces coinciding.

It should also be observed that the shape of the aperture in needle-holders as now constructed, is not confined to circular in cross-section, but is sometimes rectangular or triangular, and it may be the same in mine, as also may be the shape of the lining or bushing interiorly, and moreover it is not essential for softening the tone effect that the lining or bushing be tubular or continuous around the needle, that effect being attained by insulating so to speak, the needle body keeping it from contact with the metallic wall of the aperture in the needle-holder. But it is essential that the lining or bushing shall be of an inherently resilient material, such as rubber tubing for example, provided it be sufficiently compressible that when pressure is exerted against it by the insertion of the end of the needle or by the tone-modifying screw, a frictional resistance will be created between it and the needle end.

Having thus described my invention I claim as new and desire to secure by Letters Patent:—

1. In a sound-box having a fixed depending needle-holding arm longitudinally apertured to removably support a needle therein, with co-acting needle-holding means, a supplemental needle-holder having a supporting pin on its apex and adapted thereby to be detachably mounted in said aperture of the primary needle-holder, and in alinement therewith, said supplemental holder having a body portion which is longitudinally recessed, with a bushing of resilient material in said recess adapted to operatively support a needle by frictional contact due to radial compression.

2. In a sound-box having a fixed depending needle-holding arm, longitudinally apertured to removably support a needle therein,

with co-acting needle-holding means, a supplemental needle-holder having a body portion with a conical head and a supporting pin on the apex of said head, adapted thereby to be detachably mounted in said aperture of the primary needle-holder and in alinement therewith, said body portion being longitudinally recessed from its basal end upward, with means to removably support a needle in said recess.

3. In a sound-box having a fixed depending needle-holding arm longitudinally apertured to removably support a needle therein, with co-acting needle-holding means, a supplemental needle-holder having a body portion with a conical head and a supporting pin on the apex thereof, and adapted thereby to be detachably mounted in said aperture of the primary needle-holder and in alinement therewith, said body portion being longitudinally recessed and provided with a bushing of resilient material in said recess adapted to operatively support a needle by frictional contact due to radial compression.

4. In a sound-box having a fixed depending needle-holding arm longitudinally apertured to removably support a needle therein, with co-acting needle-holding means, a supplemental needle-holder having a body portion with a conical head and supporting pin on the apex thereof and adapted thereby to

be detachably connected to and in alinement with the primary needle-holder, said body portion being longitudinally recessed and provided with a lining of resilient material in said recess adapted to wholly insulate the needle from the metallic walls of said recess and to operatively support the shank end of the needle by frictional contact due to radial compression of said resilient lining.

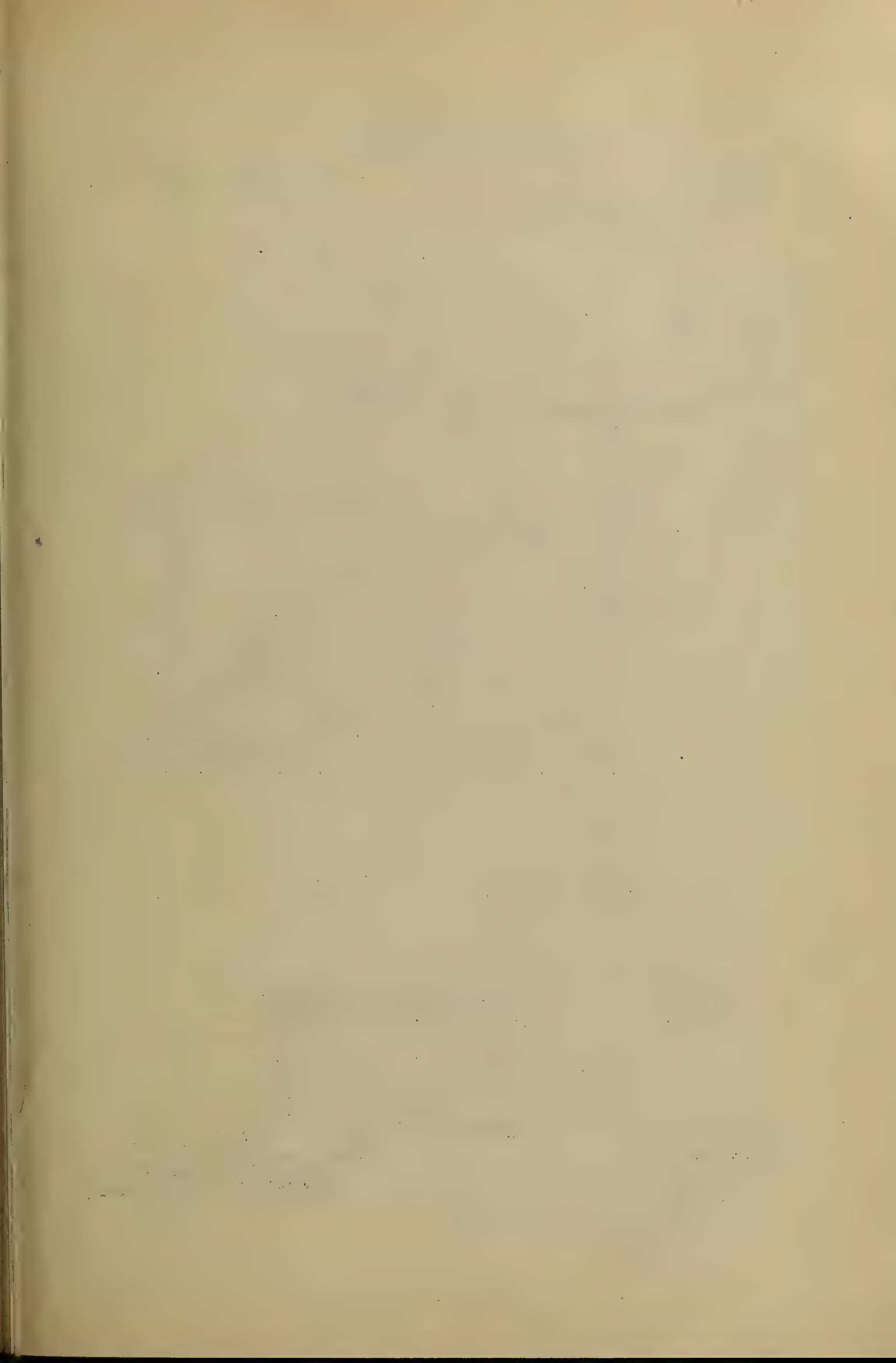
5. In a sound-box comprising a fixed depending needle-holding arm which is longitudinally apertured, and having means to detachably lock the shank of a needle therein, a supplemental needle-holder having a body portion and a supporting pin on its apex adapted to be detachably substituted for a needle in said needle-holding aperture of the primary needle-holder and in alinement therewith, said body portion having a needle-holding aperture, a bushing therein of resiliently compressible material such as rubber tubing, with means to adjustably compress said resilient bushing against the shank of the needle to vary the tone vibrations.

In testimony whereof, I have hereunto affixed my signature this thirty-first day of March A. D. 1909.

LUTHER T. HAILE.

Witnesses:

A. M. BIDDLE,
R. A. DUNLAP.

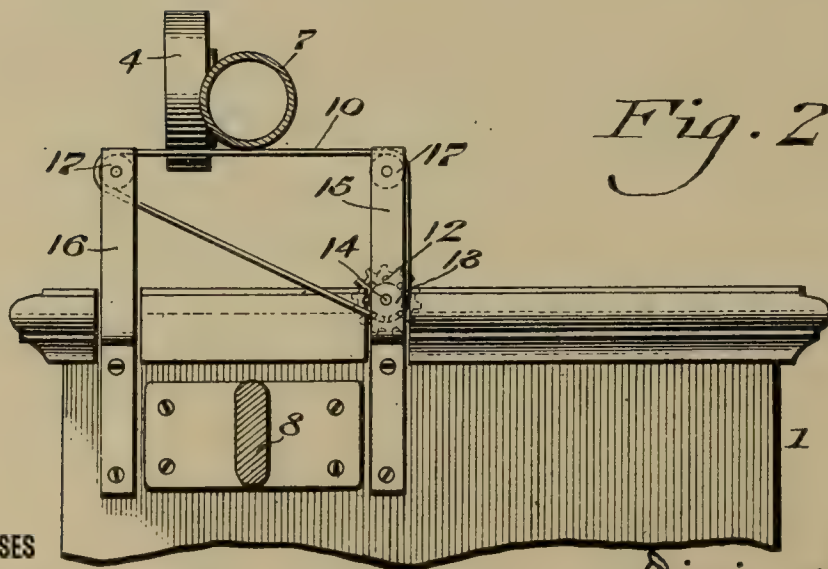
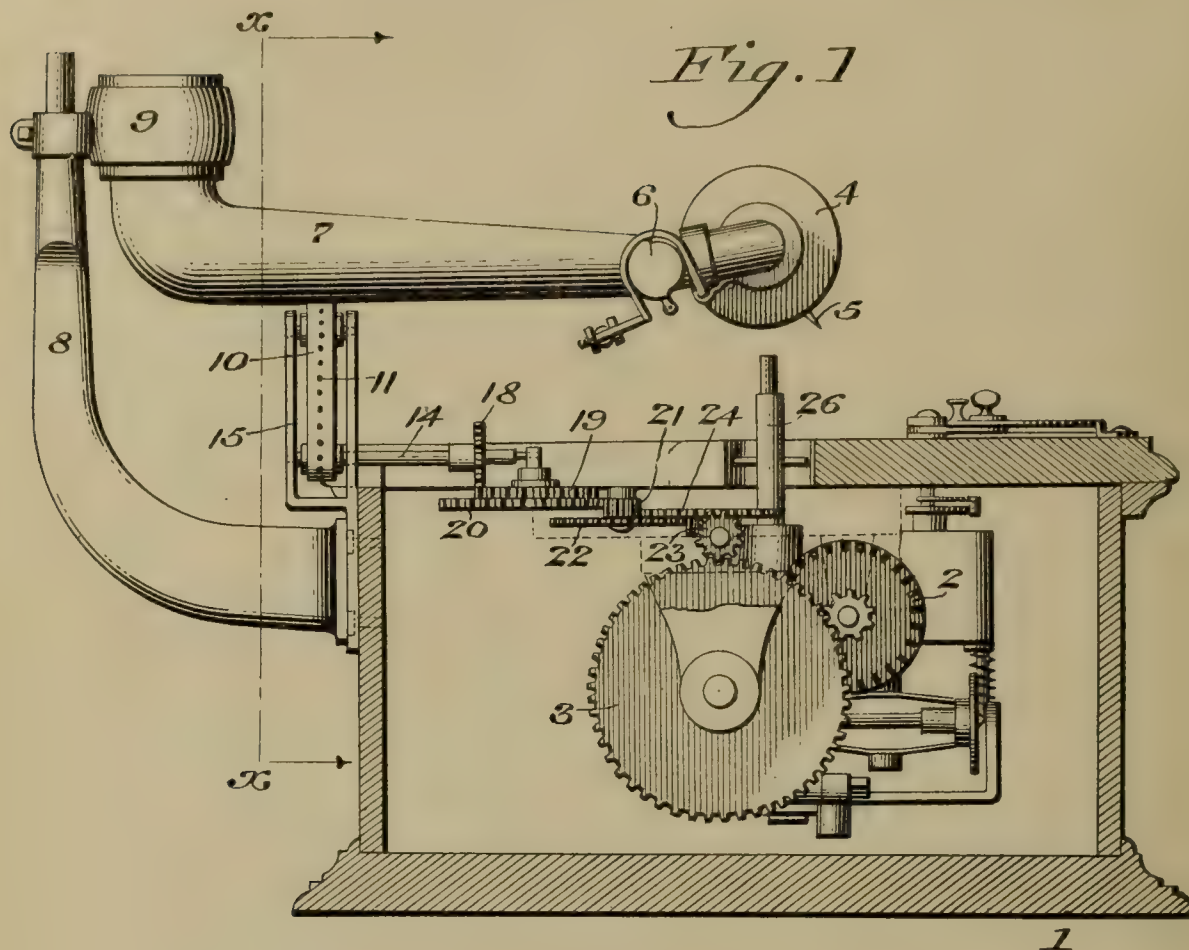


W. W. ZACKEY.
FEEDING MECHANISM FOR SOUND BOXES.
APPLICATION FILED OCT. 22, 1909.

963,847.

Patented July 12, 1910.

2 SHEETS—SHEET 1.

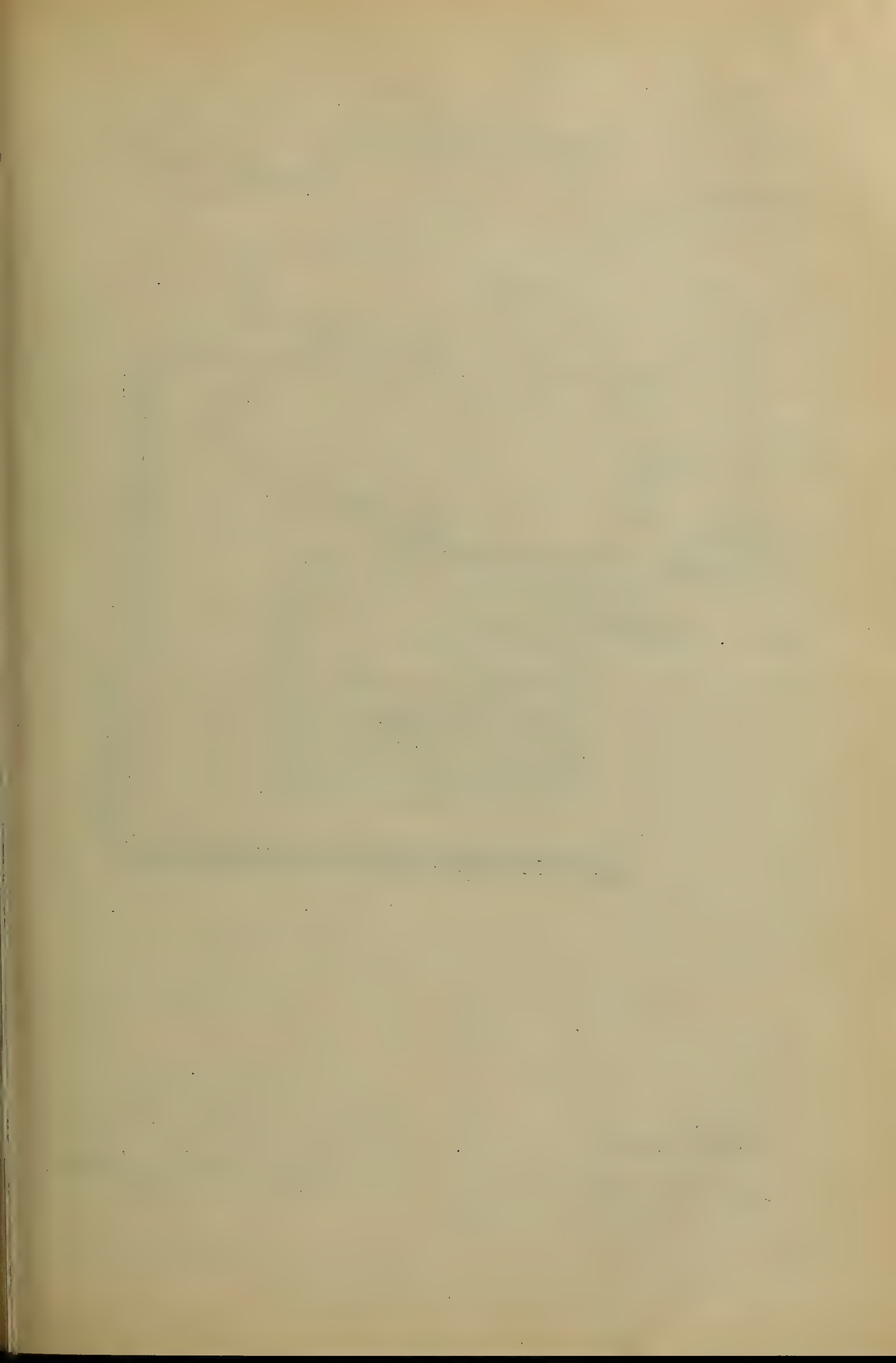


WITNESSES

P. F. Nagle.
L. Rouville

BY

INVENTOR
William W. Zackey
Robert H. Fairbank
ATTORNEYS



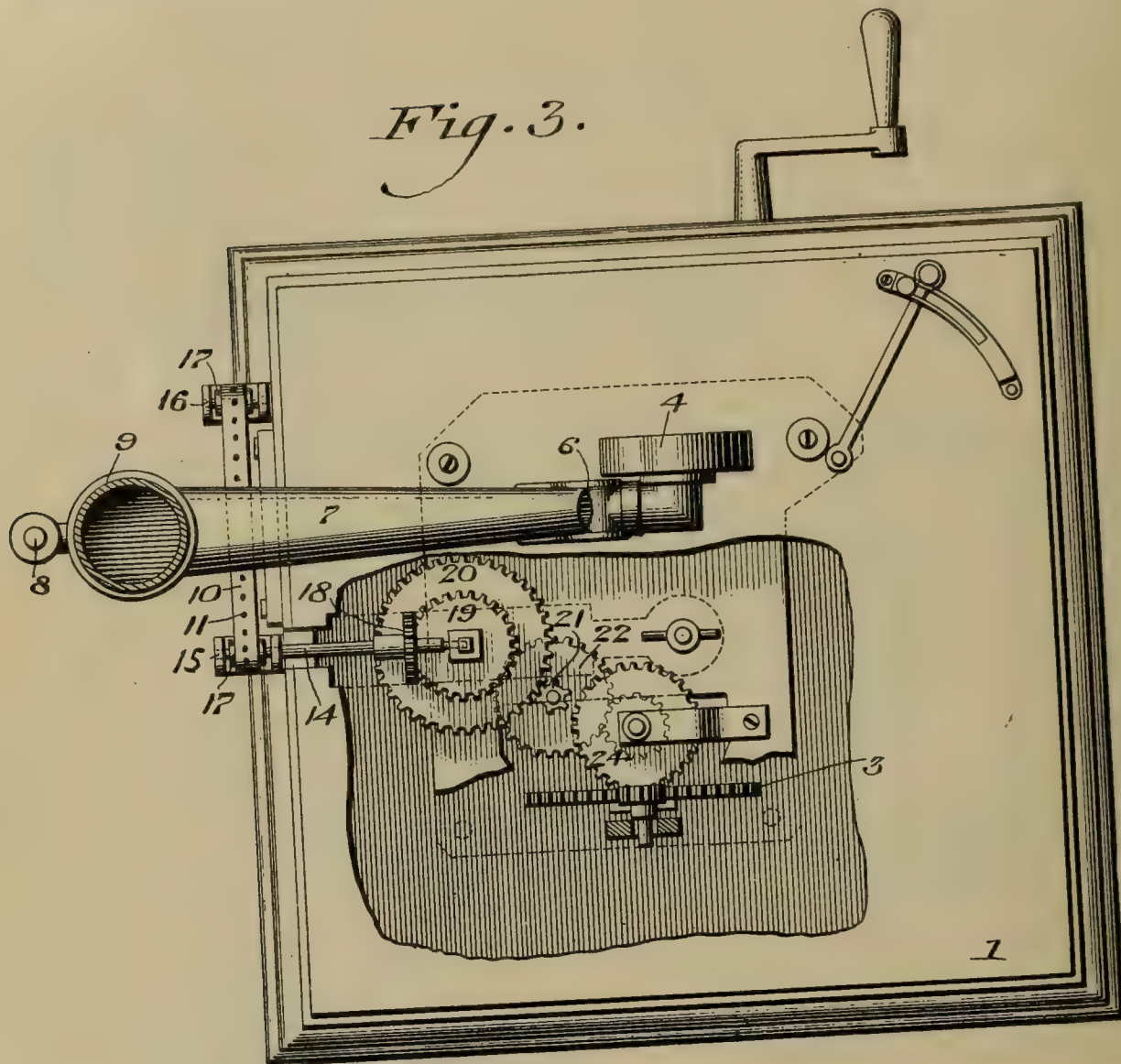
W. W. ZACKEY.
FEEDING MECHANISM FOR SOUND BOXES.
APPLICATION FILED OCT. 22, 1909.

Patented July 12, 1910.

2 SHEETS—SHEET 2.

963,847.

Fig. 3.



WITNESSES

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ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM W. ZACKEY, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF FORTY-NINE ONE-HUNDREDTHS TO CHARLES B. HEWITT, OF BURLINGTON, NEW JERSEY.

FEEDING MECHANISM FOR SOUND-BOXES.

963,847.

Specification of Letters Patent. Patented July 12, 1910.

Application filed October 22, 1909. Serial No. 523,940.

To all whom it may concern:

Be it known that I, WILLIAM W. ZACKEY, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Feeding Mechanism for Sound-Boxes, of which the following is a specification.

This invention relates to an improvement in sound recording and reproducing machines and relates more particularly to a mechanism for causing the sound box of such a machine to move across the face of a sound record independently of and in unison with the movement of the groove of the record.

In machines of this character as heretofore constructed, it has been customary for the sound box to be driven or fed across the record by the grooving therein, the result of which has been a wearing away of the sound wave impressions causing not only a gradual loss of tone quality but also a scratching sound and other unpleasant noises to mar the tone produced.

Figure 1 represents a sectional elevation of a machine embodying my invention. Fig. 2 represents a section on line $x-x$ Fig. 1. Fig. 3 represents a plan of Fig. 1.

For the purpose of illustrating my invention, I have shown in the accompanying drawings one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, 1 designates the casing of a sound reproducing machine the same having a motor 2 therein of the usual construction of which 3 designates a driving gear to which, in the present instance, I preferably connect my novel operating means for the movement of the sound box.

4 designates the sound box carrying the usual needle 5 and secured by a pivotal connection 6 to the supporting tubular member

7. This arm 7 is movably attached to a suitable bracket 8 and positioned to receive the amplifying horn, as will be readily understood, the attaching means preferred consisting of a swinging joint 9 in order that the arm 7 may be moved readily over the record or swung to one side as the case may be.

10 designates a belt provided in the present instance with perforations 11 adapted to engage the teeth 12 of a pinion 13 suitably mounted upon a spindle 14 secured in standards 15. These standards 15 are secured in any suitable manner to the casing 1 and form with a second pair of standards 16 a supporting frame-work in which the belt 10 is mounted and suitably guided by means of the rotatably mounted guide wheels 17, as will be apparent. The belt 10 is positioned adjacent and preferably beneath the arm 7 so that as the latter rests thereon the friction between the two is sufficient to carry the arm 7 across the face of a record with the movement of the belt, the travel of the box 4 being substantially synchronous with the sound waves of the groove of the record. Any suitable gearing may be provided for driving the spindle 14 to actuate the belt 10 it being of course understood that the gearing must be so designed and constructed as to produce an exact and accurate movement of the belt 10. As here shown, the gearing consists of a pinion 18 suitably mounted upon the spindle 14 and in mesh with a gear 19 rotatably mounted on the casing and having secured thereto a second gear 20 which is in mesh with a pinion 21 likewise rotatably mounted upon the casing 1 and having secured thereto a gear 22 coöperating with the pinion 23 to receive motion from the gear 24 which is driven through the medium of a pinion 25 from the gear 3.

It will of course be apparent that the record spindle 26 is driven from the motor 2 at a certain speed and in order that the needle 5 of the sound box travel in coincidence with the sound groove a very careful and exact adjustment of the several gears 18 to 25 inclusive must be made in order to transmit suitable movement to the belt 10.

It will be seen that the movement of the belt 10 is necessarily a very slow one and the friction due to the weight of the arm 7 is sufficient to carry the latter along with the belt 10 and over the face of the record with the needle in correct alinement with the

groove of the record thereby receiving the sound waves and transmitting them by way of the hollow arm 7 to the outside of the machine. Since the needle and arm 7 are driven by means entirely independent of the grooving, the scratching and dragging effect of the needle as it is pushed or fed along by the grooving are eliminated and the needle is at all times correctly positioned with respect to the grooves. A further advantage resides in not subjecting the record to wear while the unpleasant noises usually given out are substantially done away with.

It will now be apparent that I have devised a complete unitary structure well adapted for the purpose intended and which is simple in operation and construction, eliminates substantially all of the wear upon the sound record, reduces the scratching and drag of the needle and gives a clear, pure tone with a maximum of volume.

It will now be apparent that I have devised a novel and useful construction which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description and while I have in the present instance shown and described a preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages. Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a sound recording and reproducing machine, an arm suitably mounted for swinging movement, a sound box carried by said arm, a belt suitably mounted to support said arm, a motor, and driving means between said motor and belt.

2. In a sound recording and reproducing machine, an arm suitably mounted for swinging movement, a sound box carried by said arm, a belt suitably mounted to support

said arm, a motor, and means between said belt and motor to proportion the swinging movement of said arm relative to the turning movement of a sound record.

3. In a sound recording and reproducing machine, a casing, an arm suitably mounted for swinging movement relative thereto, a sound box carried by said arm, a framework carried by said casing, a plurality of guide wheels rotatably mounted in said framework, a belt contacting with said guide wheels and positioned to support said arm, a motor, and driving means between said motor and said belt.

4. In a sound recording and reproducing machine, a casing, an arm suitably mounted for swinging movement relative thereto, a sound box carried by said arm, a framework carried by said casing, a shaft in said framework, a gear carried by said shaft, a plurality of guide wheels mounted in said framework adjacent said gear, a belt having a plurality of openings therein adapted to engage said gear and passing over said guide wheels, a motor, and means between said shaft and motor to drive said shaft at a predetermined speed.

5. In a sound recording and reproducing machine, a casing, an arm suitably mounted for swinging movement relative thereto, a sound box carried by said arm, a framework carried by said casing, a shaft in said framework, a gear carried by said shaft, a plurality of guide wheels mounted in said framework adjacent said gear, a belt having a plurality of openings therein adapted to engage said gear and passing over said guide wheels, a motor, and means between said shaft and motor to proportion the movement of said belt relative to the turning movement of a sound record driven by said motor.

WILLIAM W. ZACKEY.

Witnesses:

ROBERT M. BARR,
C. D. McVAY.

7-4

16-1

964,221.

Patented July 12, 1910.

3 SHEETS—SHEET 1.

Fig. 1

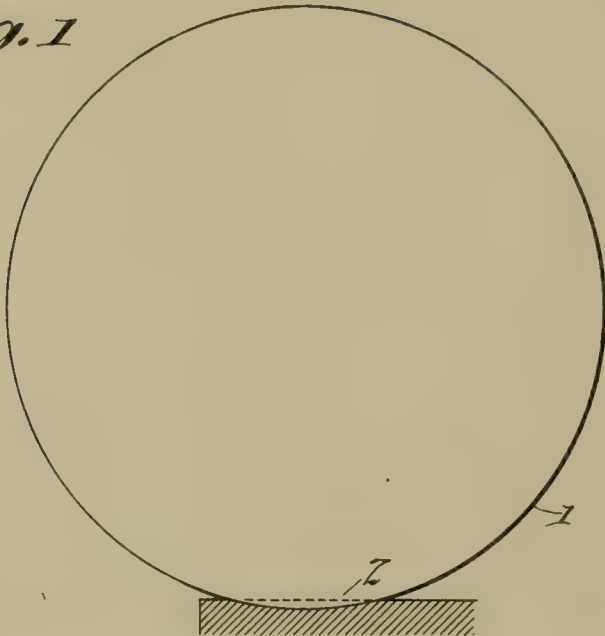


Fig. 2

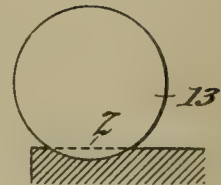


Fig. 3

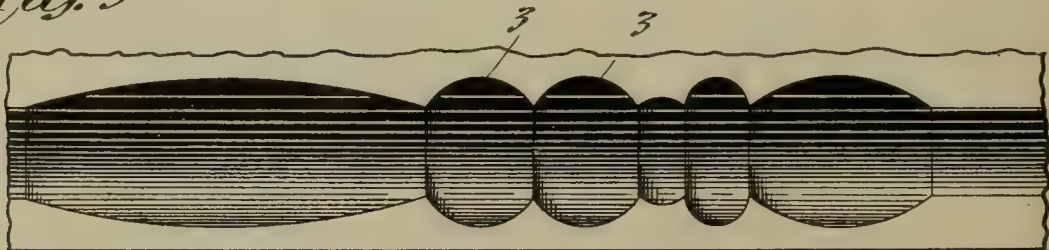


Fig. 4



Fig. 5



Witnesses:

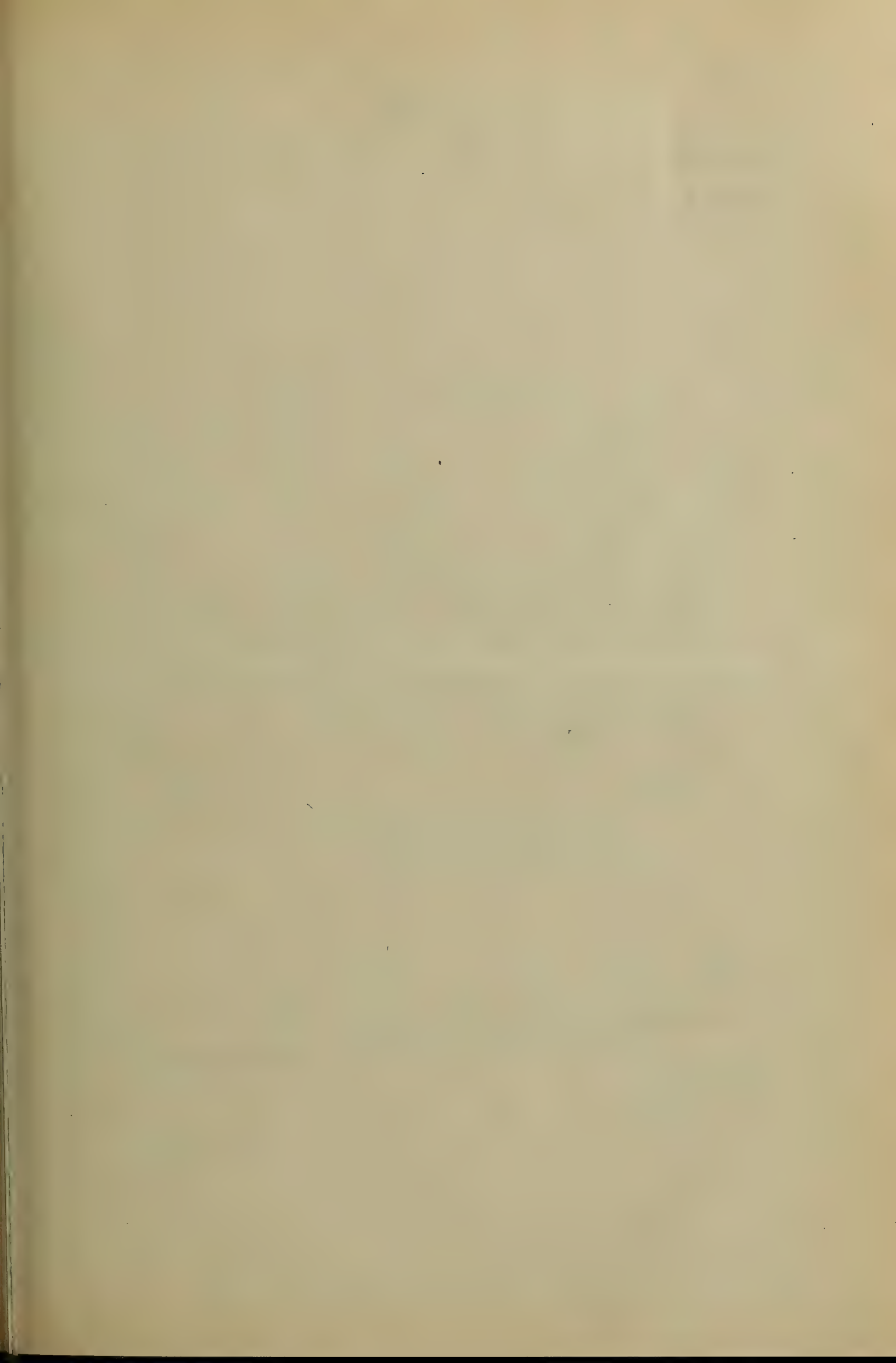
Francis D. Lewis
Delos Holden

Inventor:

Thomas A. Edison

by Francis D. Lewis

Atty.



964,221.

Patented July 12, 1910.

3 SHEETS—SHEET 2.

Fig. 8

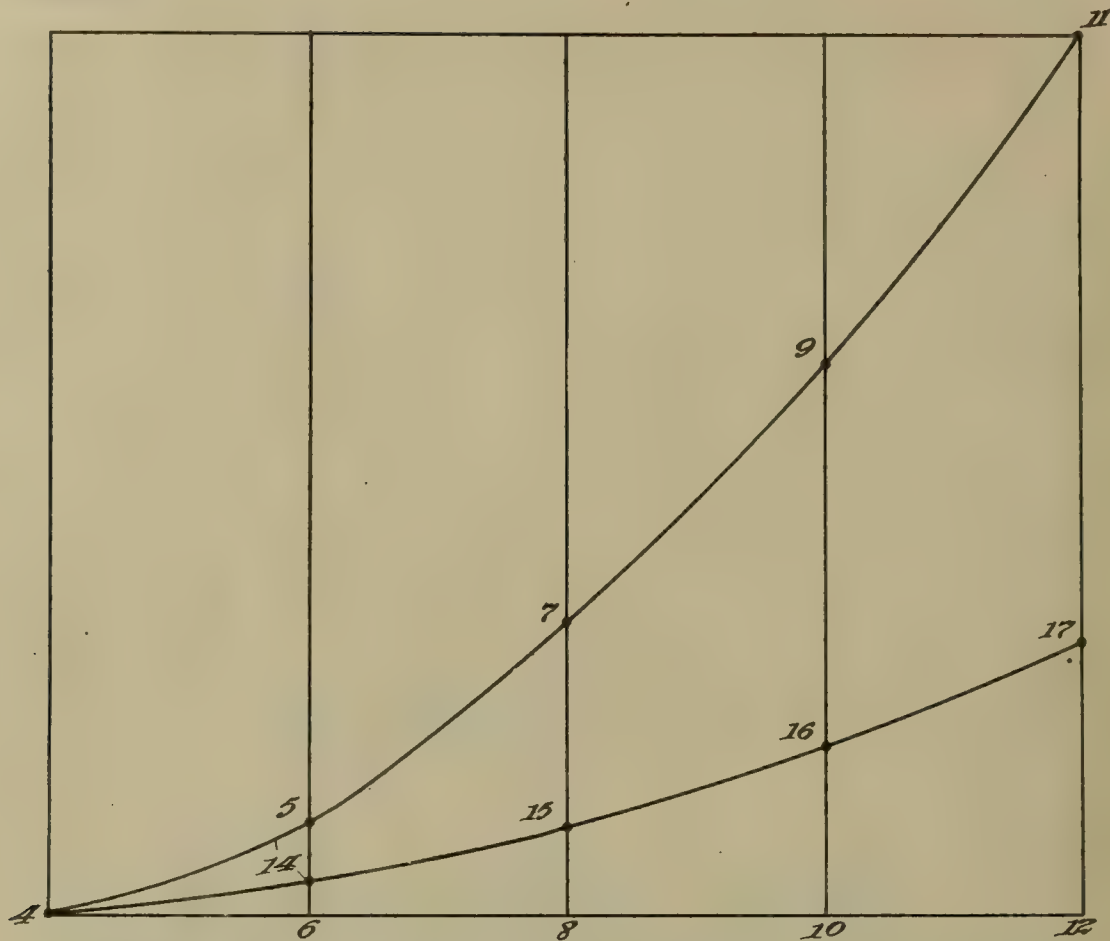


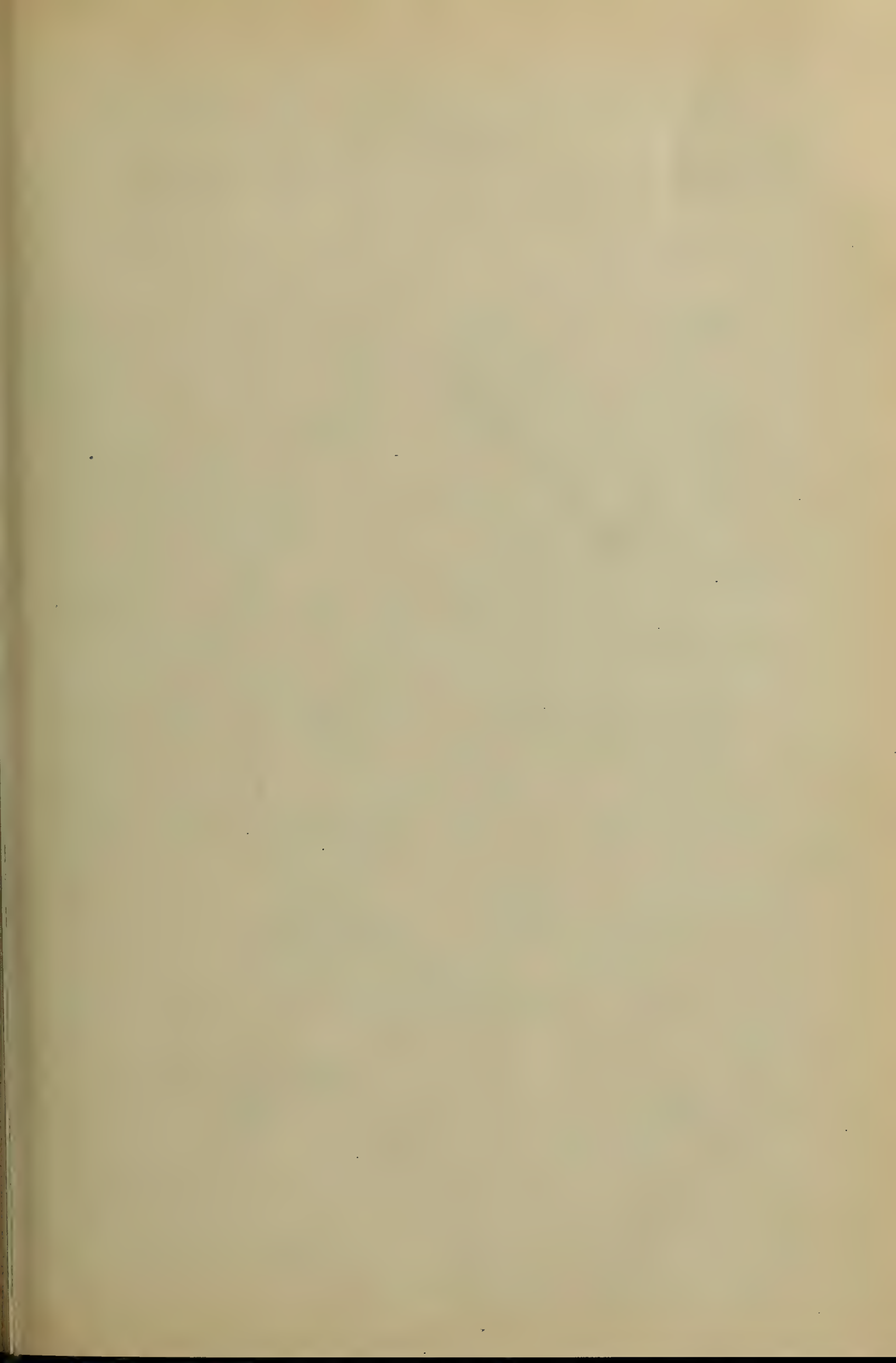
Fig. 7



Fig. 6

Witnesses:
Frank D. Lewis
Delos Holden

Inventor:
Thomas A. Edison
by Frank L. Owen
Atty.



964,221.

Patented July 12, 1910.

3 SHEETS—SHEET 3.

Fig. 10

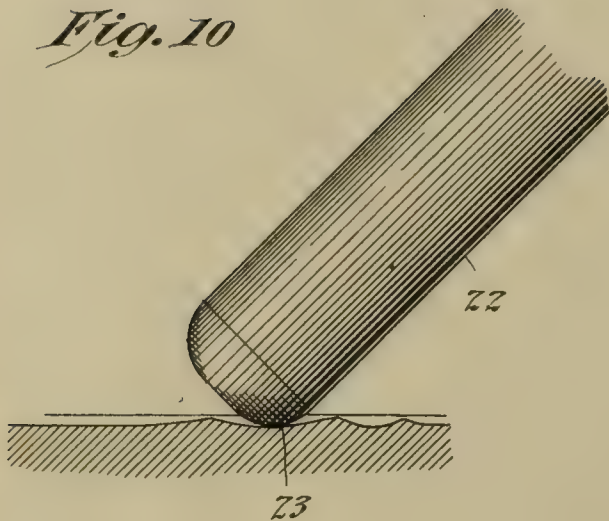
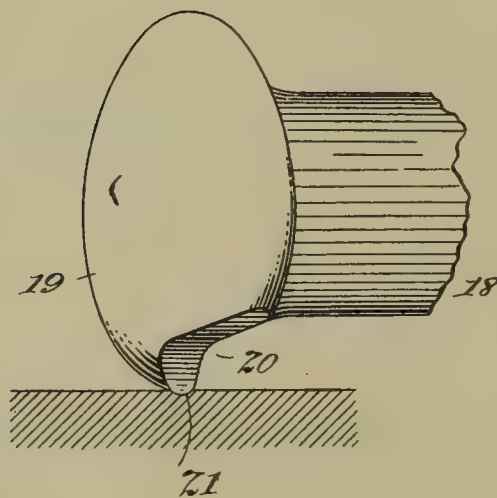


Fig. 11



Fig. 9



Witnesses:

Frank D. Lewis
Delos Holden

Inventor:

Thomas A. Edison

by Frank L. Ryan

Atty.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

SOUND-RECORD.

964,221.

Specification of Letters Patent.

Patented July 12, 1910.

Application filed January 3, 1907. Serial No. 350,646.

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, residing at Llewellyn Park, Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Sound-Records, of which the following is a description.

My invention relates to various improvements in sound records, and my object is to provide a sound record of superior quality and so relatively condensed that a much more extended reproduction may be secured from a cylinder of standard dimensions than is now possible.

As phonograph records are made under existing conditions, a circular edged recorder having a diameter of about .040 inch is engaged with a rotating blank, so as to track very slightly below the surface, the surface speed of the blank being upward of ninety feet per minute and the available recording space being only one-hundredth of an inch in width. The diaphragm being caused to vibrate under the effect of sound waves, the recording stylus will partake of the same movements so as to thereby form the record, which will obviously consist of an enormous number of minute depressions or gouges, connected together, and varying in form and dimensions. Owing to the small available width of space in which the record may be formed, and to the fact that the recording stylus is about four times as wide as that space, the deepest depressions which can be formed without overlapping upon the adjoining spaces, are extremely shallow, being about six ten-thousandths of an inch in depth. The walls of such a record groove in which the relation of width to depth is about sixteen to one, are of such slight curvature that difficulty is experienced in tracking the record, unless the reproducer stylus is mounted with great flexibility. Furthermore, with records of standard length, slightly over four inches, and turning at the usual speed of 160 revolutions per minute, the available time in which to record the desired sounds is less than three minutes, so that many songs or musical selections cannot be entirely recorded. It would be inexpedient to reduce the surface speed of the blank, because experience has shown that for the correct recording and re-

production of music any attempt to materially reduce the relation of length to width of the recorded waves or depressions, depreciates the quality of the reproduced sounds. In my Reissue Patent No. 11,857 of September 25th, 1900, I discussed this point in detail. On the other hand, to make any change in the dimensions of the records themselves, would unfit them for use with hundreds of thousands of talking machines now on the market. Finally, under existing conditions and dealing with a recording stylus four times as wide as the space in which it cuts, the resistance to the entrance of the cutting edge into the material, increases very rapidly for each succeeding increment of depth; or in other words, the energy required to force the cutting edge into the material for the first quarter of the maximum cut is very much less than that required to force the cutting edge into the material for the final quarter of the maximum cut. Consequently, sounds which are relatively weak, are more perfectly recorded than very loud sounds, because with the former the amplitude of vibration of the recording stylus will more nearly coincide with that of the sound waves.

What I propose by my present invention is to produce a sound record having the following characteristics: (1) It is of the standard dimensions of length and diameter, so that it may be used on existing talking machines by making very slight changes therein. (2) The quality of the recorded and reproduced sounds will be superior to that of records made under existing conditions, without, however, in any way affecting the loudness of the reproduction, and (3) the time of reproduction and of recording will be greatly extended, whereby songs and musical compositions now impossible of successful recording, may be satisfactorily recorded and reproduced. To secure these results, I make my improved record on a recording machine having a feed screw with a much finer pitch than the present standard, and preferably a pitch of two hundred threads per inch, and I make use of a recording stylus, the curve of which presents a circle whose diameter is only about twice that of the available space, instead of four times the same, as under existing conditions. I find, as a result of calculation and experi-

ment, that in order to cut a record to the present maximum depth in a space one-two-hundredth of an inch wide, instead of one-one-hundredth inch, the recording stylus instead of being one-half the diameter as that used in the latter case, as might be supposed, should in fact be only about one-fourth the diameter, or according to my calculations, about .0105 inch. By making use of a pitch of two hundred threads per inch, I obtain twice the length of record groove, so that if the surface speed remains unchanged, I am in this way enabled to double the time of recording and reproducing. The change, however, would make it possible to materially reduce the surface speed, since owing to the narrowness of the record groove, a reduction in speed to half that now used, would result in the same relative shape of the waves or depressions, and hence the latter could be tracked with the same facility as those now made under existing conditions at double the speed, if the reproducer stylus bore the same relation to the size of the record as at present. Since, however, the reproducer stylus would have a diameter of less than ten one-thousandths of an inch as against thirty-five one-thousandths, it would track such a record with greater facility than can the present reproducers track the record groove as now made. Of course, to reduce the diameter of the reproducing stylus to one-fourth that now employed, and to reduce the surface speed one-half, would be to impose very much greater wear on the record surface, and would necessitate the employment of very hard materials. With materials of a wax-like nature adapted to be molded by casting, as I shall presently describe, it will probably be commercially desirable not to materially reduce the speed, but in the case of metallic records, which are perfectly feasible though expensive, a reduction in speed to one-half can be readily made without seriously affecting the quality of the reproduction. At the same time the loudness of the reproduction is not affected, since the amplitude of vibration of the diaphragm is not changed. I therefore prefer to maintain the surface speed substantially what it is at present, not only to prevent undue wear, but to improve the quality of the reproduction, since by making the width of the record groove only one-half its present dimension without increasing the length of the various depressions which characterize the same, and by reducing the diameter of the stylus to one-fourth the size now used, I am enabled to accurately track the extremely fine and delicate portions of the record representation of overtones and the finer shadings of the principal tones. In other words, the effect is substantially the same as if under existing conditions the surface

speed were doubled and the diameter of the reproducer ball were reduced one-half, without, however, encountering any foreign sounds that might be produced by such a high speed.

By employing a recording stylus, whose diameter is only about twice the available space in which to record, instead of four times the space as is now the case, the record groove will be formed with much more clearly defined side walls, and consequently, the reproducer stylus will track such a groove with greater ease and certainty than the very shallow grooves that are formed under existing conditions. Furthermore, a recording stylus as I propose herein, more nearly approaches the theoretically perfect device in which the resistance to the cutting effect is the same for each successive unit of depth. Although with the new recording stylus the rate of energy required to force the cutting edge into the material increases perceptibly with the depth of cut, it is far less than the rate of increase of energy necessary to force the present size of stylus into the recording material to the same depth. By reason of this fact, with my improved arrangement, the record groove will be more nearly a graphic representation of the sound waves, and there will be less aberration in the reproduction, particularly on loud notes, than is now the case. Furthermore, by reason of the small diameter of such a recorder, it cuts more readily into the material and hence imposes a smaller resistance to the vibration of the diaphragm than a larger stylus, such as those now used. Consequently, the diaphragm may be made lighter and more responsive to the sounds.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming part of this specification, and in which—

Figure 1, is a diagrammatic view, one hundred times enlarged, showing a recording stylus, as at present used, and illustrating the relative depth and width of its maximum cut; Fig. 2, a similar view, showing the improved recorder on the same scale; Fig. 3, a plan view on the same scale, showing part of a record groove, formed by the recorder of Fig. 1; Fig. 4, a similar view on the same scale, showing the same record formed by the recorder of Fig. 2, at the same surface speed; Fig. 5, a similar view on the same scale, showing the same record formed by the recorder of Fig. 2, at one-half the surface speed; Fig. 6, a diagrammatic sectional view, six hundred times enlarged showing graphically the area of the material removed by the stylus of Fig. 1, in cutting to the full maximum depth and to one-fourth, one-half, and three-fourths thereof respectively; Fig. 7, a similar view on the same scale in connection with the stylus

shown in Fig. 2; Fig. 8, a diagram illustrating graphically the area of material removed by the two forms of stylus, in the four positions shown in Figs. 6 and 7; Fig. 9, a perspective view of a suitable recording stylus for making improved sound records, and Figs. 10 and 11, side and end views of a suitable reproducing stylus for engaging the same.

Similar parts are represented by the same reference numerals.

Referring first to Fig. 1, I show the recording stylus 1, of a diameter of .04 inch and tracking to the maximum depth in the recording material 2. The depth of this cut is extremely slight, being in fact, only about six ten-thousandths of an inch. Such a record groove is also very shallow, its maximum width being about sixteen times its maximum depth, so that its side walls are hardly defined at all, and, in consequence, very slight side stresses will throw the reproducer out of the groove, to produce "skipping".

In Fig. 3, I show a plan view of a part of a sound record, which would be formed by the recorder described. Many of the depressions or waves are of greater length than width and hence can be tracked by a spherical stylus, or more perfectly by a button shaped stylus as described in my reissue patent, but certain of the depressions, which are frequently encountered in practice, and which probably are representations of overtones or very weak fundamental tones, are materially shorter than their width and are difficult to reproduce, except with a stylus having an objectionably narrow beaded edge. It will be seen from Fig. 6, showing the same groove, in cross section, many times enlarged, that the recorder in entering the material for the first quarter of its maximum movement is required to remove much less material than in movement during the next quarter, whereby the resistance offered to the stylus will very greatly increase as it cuts into the material. I have made a careful computation of the areas included within the dividing lines of this figure, and have plotted them on Fig. 8. Thus the line 5—6 may be considered as representing the area of cross section of the material removed during the first quarter of the cut, or the resistance to the cutting tool; to the same scale, 7—8 represents the area removed or resistance to cutting during the second quarter, 9—10 during the third quarter and 11—12, the fourth quarter. The rate of increase of resistance to the cutting effect of the style, may be graphically represented by the curved line 4, 5, 7, 9, 11. From this diagram, it will be evident that as the stylus cuts into the material, the resistance encountered increases very rapidly, and becomes very pronounced as the stylus reaches

the maximum depth. Consequently, the record will be distorted, the portions thereof representing loud sounds being proportionately more imperfect than the portions representing weaker sounds.

Referring now to Fig. 2, I illustrate the new recording stylus 13, whose cutting edge presents a curve slightly more in diameter than twice the width of the available recording path, which I prefer to make one two-hundredths of an inch or thereabout. I find that in the case of two hundred threads per inch, the diameter of the stylus should be almost exactly .0105 inch to cut to the same depth as the stylus 1 in the case of one hundred threads per inch. Such a record, as shown in Figs. 2 and 7, is provided with very clearly defined side walls, its maximum width being only about eight times its maximum depth, and in consequence the reproducer stylus will be kept in engagement therewith with much greater certainty than in the case of the very shallow record groove of Fig. 1.

In Fig. 4, I illustrate the appearance of the same record shown in Fig. 3, assuming it to have been made with the small recorder of Fig. 2, and at the same surface speed. Here it will be seen that the narrowing of the record groove has altered the shape of the depressions or waves, so that the latter are apparently much extended (see for example, the two depressions 3, 3) and the reproducer stylus can more readily engage and track the same, particularly since the diameter of the stylus is only about one-fourth of that now used. In fact, to produce the same relative formation of the waves or depressions, to give the effect shown in Fig. 5, the surface speed would have to be reduced one-half. With very hard material, that might be done with excellent results, but with wax-like materials although relatively hard, I prefer to maintain the surface speed as at present, in order not to make the wear on the record excessive. At the same time, as already indicated, by maintaining the present surface speed so as to double the relative length to breadth of the individual depressions constituting the record, and by reducing the diameter of the reproducer ball to about one-fourth, conditions are present under which the stylus will very much more perfectly track all portions of the record. In fact, those portions of the record which under existing conditions are not tracked at all, for instance, those representing the overtones of the finer shadings of the fundamental tones, will be perfectly tracked under the conditions presented herein so as to add materially to the quality of the reproduction.

In Fig. 7, I illustrate in cross section, many times enlarged, the record groove made with the stylus of Fig. 2, and in which the

same comparison is made as in Fig. 6. Here it will be seen, that the amount of material to be removed is not only much less than with the larger stylus, but the resistance to the cutting effect as the stylus enters the material is more nearly uniform. This is perhaps better shown in Fig. 8, where the area 4, 14, 6, represents the area of material removed by the stylus during the first quarter of its maximum cut; the area 6, 14, 15, 8, the area for the second quarter; the area 8, 15, 16, 10 the area for the third quarter; the area 10, 16, 17, 12, the area for the last quarter. The rate of increase of resistance to the cutting effect of the style may be graphically represented by the curved line 4, 14, 15, 16, 17. A comparison of that line with the line 4, 5, 7, 9, 11, shows very graphically the diminished rate of increase of resistance to the cutting effect, in the case of the stylus of Fig. 2, as compared to Fig. 1, and at the same time a comparison of the total areas of material removed at any given depth of cut by the respective recording styluses, discloses graphically the great difference in the work to be performed thereby, and the relative ease with which the smaller stylus enters the material. Of course, in making these comparisons between the two forms of stylus, I have not gone to the extent of determining the cubical contents of the masses of material removed by them; but the comparison is sufficiently illustrated by referring to cross-sectional areas alone.

From the comparison above made, it will be evident that with a recording stylus, such as shown in Fig. 2, the distortion, due to the resistance of the material to the cutting effect will be considerably less than with the stylus shown in Fig. 1, and there will also be less difference in the distortion of records, representing loud sounds, and those representing weaker sounds, than is now the case, so that records made with the improved stylus will be of superior quality than those which can be made under existing conditions. Furthermore, the stylus shown in Fig. 2, cuts more readily than the stylus shown in Fig. 1; consequently, the diaphragm with which it is used may be made more sensitive and therefore more readily responsive to the sound vibrations.

A form of recording stylus, suitable for cutting the extremely minute record, herein contemplated, is shown in Fig. 9, and is described in detail and claimed in an application filed by me on even date herewith. With this recording stylus the stylus is provided with a shank 18, formed with a button head 19, having a cutaway portion 20, so as to result in the production of a cutting edge 21. The curve of the head 19 is of a proper radius to give the desired maximum cut within the necessary restricted path offered for the reception of the record. In

the case of a record that is 200 threads per inch, the diameter of the circle representing the cutting edge should be slightly greater than one one-hundredth of an inch as I have previously explained. It will, of course, be understood, however, that while such a recorder is entirely suited for the purpose, any other form of stylus having a circular or approximately circular cutting edge that is sufficiently small in diameter may be made use of.

In Figs. 10 and 11, I illustrate a suitable form of reproducing stylus for engaging the very fine record, and which may be made of the desired smallness in diameter. This stylus comprises a cylindrical shank 22, the lower end of which is formed with a rounded engaging edge 23 to accurately track the record, the stylus being preferably maintained in engagement with the record at substantially the angle shown. Like the recorder of Fig. 9, the reproducer shown in Figs. 10 and 11, may be replaced by other forms of stylus, suitable for the purpose. In making the improved records, it is, of course, necessary to make use of a recording machine, the pitch of whose feed screw is sufficiently fine for the purpose, say—200 threads per inch. Having obtained a satisfactory master in such a machine, I prefer to make duplicates therefrom by any suitable process, instead of using them for direct reproduction, since, owing to the fineness of the record groove, it is important that relatively hard material should be used, on which the records could not be satisfactorily made in the first instance. A suitable duplicating process by means of which copies may be made from a mold secured from such a master, is disclosed in a patent of J. W. Aylsworth, No. 855,605 granted June 4, 1907, wherein the mold is rotated at a high speed and the molten material is caused to be distributed over the bore thereof by reason of the centrifugal force developed, after which the rotation is continued until the material has set sufficiently to maintain its shape. The material is then allowed to cool until it shrinks from the mold, after which the record is finished on its interior, and ends, if necessary. If the records are to be made of a wax-like material, as becomes readily possible with such a process as that indicated, I select a material which is very hard and tough, so as to resist the wear, which would be obviously greater than if a larger stylus is used, as under present conditions. Suitable materials may, however, be made, which will be sufficiently tough as to permit the improved records to compare favorably as to their wearing qualities with records made under existing conditions. An example of such a composition is disclosed in an application of J. W. Aylsworth, filed November 7,

1906, Serial No. 342,318, said composition comprising a mixture of asphalt, stearate of lead and a resin gum. In using my improved records on existing talking machines, the only changes therein which will be required will be the substitution of a finer reproducing stylus, possibly a more sensitive diaphragm, and mechanical connections by which the stylus will be caused to track the finer thread of the record. This latter may be done by either substituting a finer pitch feed screw on the reproducing machine, or by making use of a differential feed mechanism, or any desired connections between the driving shaft and the feed screw, by which the desired feed of the reproducer arm may be effected from the original 100 thread feed screw of the present standard.

It will be understood that where in the claims I refer to my sound record as one whose record groove is approximately circular in cross section, the latter may be a curve which is either circular or closely approximates the arc of a circle within the limits of the record groove. Thus, the groove is circular if cut by the recorder shown in Fig. 9, or by the recorder shown in Fig. 2 if the shank thereof is maintained parallel to the record surface. If, however, the shank of the recorder stylus is set at an acute angle to the record surface, as for example, an angle of 10 to 20 degrees, as is usual in practice, the cross section of the groove will be an arc of an ellipse of such slight eccentricity, however, as to very closely approximate the arc of a circle. Similarly if the recorder has a cutting edge which only approximates a circle, the groove cut thereby would accordingly vary slightly from the circular in cross section.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. As a new article of manufacture, a duplicate sound record made of a hard tough material, whose record groove is substantially circular in cross section, of a pitch of approximately 200 threads per inch, and the maximum depth of which groove is greater

than $\frac{1}{10}$ of its maximum width, substantially as set forth.

2. As a new article of manufacture, a duplicate sound record made of a hard tough material, whose record groove is substantially circular in cross section, has approximately 200 threads per inch, and is of a maximum depth approximately one-eighth of its maximum width, substantially as and for the purposes set forth.

3. As a new article of manufacture, a sound record having a continuous record groove formed thereon having a pitch of approximately 200 threads per inch, the record groove having in cross section approximately the form of an arc of a circle the diameter of which is approximately twice the maximum width of the groove, substantially as set forth.

4. As a new article of manufacture, a sound record having a continuous record groove formed thereon having a pitch materially finer than 100 threads per inch, the record groove having in cross section approximately the form of an arc of a circle the diameter of which is less than .013 inch, the maximum depth of the groove being greater than $\frac{1}{10}$ its maximum width, and the gouges or waves of maximum width occupying substantially all the available space transversely of the record groove, substantially as set forth.

5. As a new article of manufacture, a sound record having a continuous record groove of the vertically-undulating type formed thereon having a pitch materially finer than 100 threads per inch, the record groove having in cross-section approximately the form of an arc of a circle the diameter of which is between three times and one and one-half times the maximum width of the groove, the maximum depth of the groove being greater than $\frac{1}{10}$ its maximum width, substantially as set forth.

This specification signed and witnessed this 28th day of December 1906.

THOS. A. EDISON.

Witnesses:

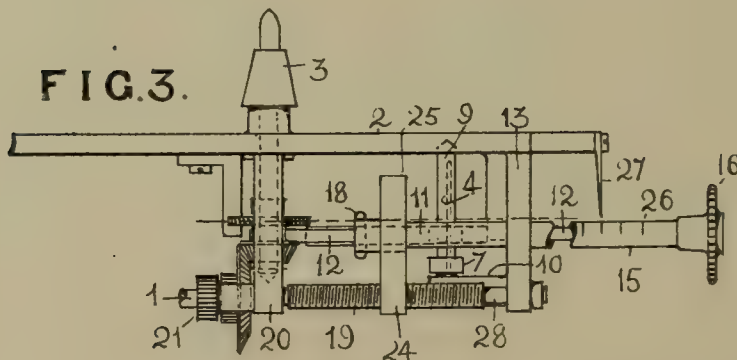
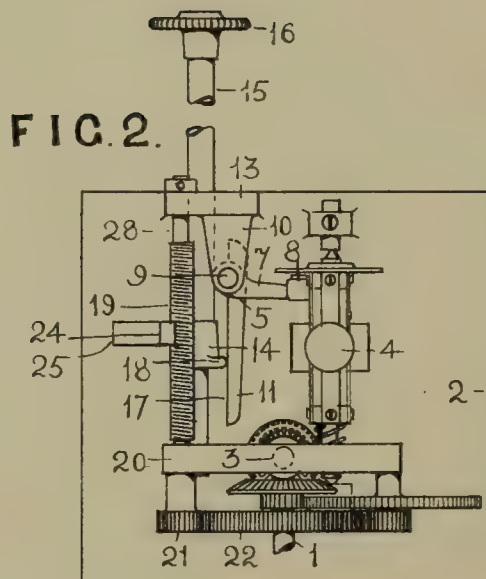
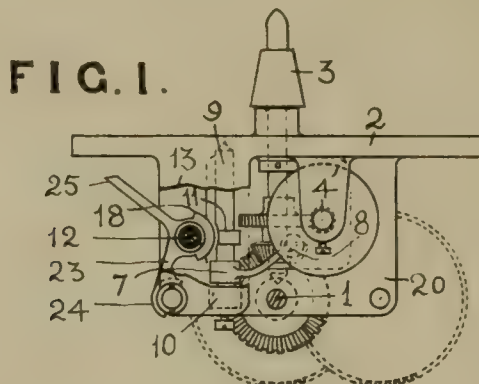
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- music -

G. OULTON, C. ABLETT & W. E. LIGHTFOOT.
 SPEED REGULATING DEVICE FOR SOUND RECORDING AND REPRODUCING MACHINES.
 APPLICATION FILED FEB. 23, 1909.

964,684.

Patented July 19, 1910.



Witnesses

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UNITED STATES PATENT OFFICE.

GEORGE OULTON, CHARLES ABLETT, AND WILLIAM EDWARD LIGHTFOOT, OF
LIVERPOOL, ENGLAND.

SPEED-REGULATING DEVICE FOR SOUND RECORDING AND REPRODUCING MACHINES.

964,684.

Specification of Letters Patent. Patented July 19, 1910.

Application filed February 23, 1909. Serial No. 479,670.

To all whom it may concern:

Be it known that we, GEORGE OULTON, CHARLES ABLETT, and WILLIAM EDWARD LIGHTFOOT, subjects of the King of Great Britain and Ireland, residing at Liverpool, in the county of Lancaster, England, have invented new and useful Improvements in Speed-Regulating Devices for Sound Recording and Reproducing Machines, of which the following is a specification.

This invention relates to sound recording and reproducing machines employing disk records and particularly to such machines in which the speed of the motor can be continuously varied so that the relative linear speed between the record line and the stylus remains constant, or otherwise stated, the angular speed of the motor increases or decreases according to whether the record commences at the periphery or near to the center of rotation.

The object of this invention is to obtain the differential speed of the motor in a simple and efficient manner and dispense with any connection between the sound box or carrier thereof and the speed controlling device, providing means at the same time for indicating the proper position of the speed controlling device for records of different diameters.

The invention also provides that the motor can be run at a constant speed so that the ordinary or standard disk records can be used at will.

Hitherto the speed of motors in recording and reproducing machines, has been controlled by a cam actuated by or with the sound box carrier, the cam bearing against the brake lever so as to constantly vary its position, the sound box carrier in some cases being traversed or guided solely by the spiral record groove or line through the stylus and in other cases a screw and nut being used to traverse the said carrier and cam together, the latter moving across the brake lever in contact therewith. In these two cases it is obvious that the sound box carrier being connected directly or indirectly to the speed changing device, the correct starting speed would synchronize with the position of the stylus on the record disk.

According to our invention, the sound box arm or carrier is quite independent of the speed controlling device, and we employ a graduated scale and pointer to indicate the

proper starting speed for different sized records.

The drawing attached hereunto, illustrates our invention applied to the ordinary speed controlling device used in sound recording and reproducing machines.

In Figure 1 is represented an end elevation of the mechanism. Fig. 2 represents a plan of the same looking from underneath. Fig. 3 represents a side elevation omitting some of the parts for clearness' sake.

Referring to the several views, 1 represents the motor shaft, 2 the base plate of the mechanism, 3 the turntable or last motion shaft, 4 the centrifugal speed controlling device and 5 the brake lever. The brake arm 7 of the brake lever, carrying the leather or like brake shoe 8 is fixed to a spindle 9 centered between the base 2 and a bracket 10. The other arm 11 of the brake lever, is in the case illustrated approximately at right angles to the arm 7. A slideway consisting of a rod 12 fixed at one end in the bracket 13 is arranged alongside the arm 11 and upon this rod is a slide piece 14 carried at the end of a tubular rod 15 into which the rod 12 telescopes. A handle such as a milled disk 16 is fixed at the end of the rod 15 for the purpose of drawing it in and out and turning it partly round. When the motor is working, the brake disk 16 is drawn toward the brake arm 7 by the centrifugal action of the governor and keeps the arm 11 pressed against the slide piece 14. The inside face 17 of the arm 11 is approximately straight and when the nose 18 of the slide piece 14 is in contact with the arm toward its lower end as seen in Fig. 2, the said face 17 lies at an angle in relation to the slideway so that as the slidepiece is drawn out the end of the arm 11 approaches the slideway and the brake shoe 8 recedes before the governor disk 16. By this means, the motor can be set to run at any constant speed in the usual way by fixing the position of the brake arm to accord with the desired speed, through the slide piece 14. The brake may also act as a stop when the slide piece is pushed right down, by pressing hard upon the disk 16 when in its uppermost position. In order to automatically vary the speed of the shaft 3 as the motor is running down, by means of the above described device, a fine pitched screw 19 is mounted in bearings in the brackets 13 and 20, parallel with the

slideway 12. This screw is turned continuously by the motor through the pinion 21 gearing with one of the wheels 22 of the motor. The slidepiece 14 is provided with a pivoted arm 23 formed with a half nut 24 at its end, adapted to engage with the screw as shown, and by turning the milled disk 16, to be disengaged therewith. The finger 25 acts as a stop to the further turning of the slide piece when the nut is disengaged. The nose 18 of the slide piece is in the form of an arc as shown in Fig. 1, so that it remains in contact with the arm 11 when the milled disk 16 is turned either way.

A convenient form of indicator for setting the position of the slide piece in relation to the brake lever so that the correct starting speed can be obtained is shown in Fig. 3. The rod 15 is marked with a scale 26 representing the different diameters of records, and a pointer 27 is shown fixed to the base 1.

By disengaging the nut from the screw and pushing the rod 15 inward to its full extent, the slide piece 14 forces the arm 11 away from the slideway and thereby jams the brake on the disk 16 preventing the motor from working. By drawing the slide piece out the nut being still disengaged, the motor will run at a speed in accordance with the sensitiveness of the governor and varying with the position of the slide piece in relation to the fulcrum of the lever, in the manner generally used. By turning the rod 15 partly around and thereby engaging the nut with the screw, the latter revolving at a definite rate carries the slide piece along with it toward the fulcrum of the brake lever, assuming the nut was engaged toward the end of the arm 11, thereby causing the brake shoe 8 to gradually recede from the brake disk when at rest, at a definite rate and controlling the brake pressure applied through the centrifugal action of the governor.

Provision is made for the nut to run off the threads of the screw by the clearance space 28.

What we claim as our invention and desire to secure by Letters Patent of the United States is:—

1. In machines for recording and reproducing sounds, in which disk records are employed, the combination with a motor having a centrifugal frictional speed governor with a pivoted brake lever, of a slidable piece traversed by the motor along a slideway, an extending rod with handle and disengaging means to set the slidable piece at any part of the slideway, an indicator to show the position of the slidable piece on the slideway, an arm on the brake lever in a plane parallel with the slideway, and means on the sliding piece and in connection with said arm so that as the sliding piece is moved

the brake lever is rocked on its pivot for the purpose herein set forth.

2. In machines for recording and reproducing sounds, in which disk records are employed, the combination with a motor having a centrifugal frictional speed governor with a pivoted brake lever, of an arm fixed to the brake lever and having a straight edge, a slideway alongside said arm and in a plane parallel therewith, a slide piece on said slideway and having a sectoral face to bear against the straight edge of said arm, said slide piece being adapted to turn angularly on said slideway, a screw geared to the motor so as to turn therewith and parallel with the slideway, a half nut fixed to said slide piece and adapted to engage with or be disengaged from the screw when the slide piece is turned, an extending rod fixed to the slide piece and provided with a handle so that it can be turned or drawn in or out at will, and an indicator and scale for showing the longitudinal and engaging position of the slide piece and nut on the slideway for the purpose herein set forth.

3. In machines for recording and reproducing sounds, in which disk records are employed, the combination with a motor having a frictional centrifugal speed governor with a pivoted brake lever, of a straight arm fixed to the brake lever, a round rod fixed alongside the said arm in a parallel plane, a screw geared to the motor so as to continuously rotate, and mounted in bearings so as to lie parallel with the said rod, a tube telescoped on said rod and having a handle at its outer end and a sectoral projection at its inner end adapted to bear against the straight side of the said arm of the brake lever and remain in contact while being turned around, a stop to limit the angular movement of said tube, a half nut carried at the end of an arm fixed to the tube and adapted to engage with and disengage from said screw when the tube is turned, a stationary pointer, and a scale marking on the said tube adapted to correspond with different positions of sectoral projection, substantially as described and for the purpose herein set forth.

4. A speed regulating device for sound recording and reproducing machines comprising in combination, a governor for the machine provided with a braking member, a constant speed threaded rod operated by the machine, and a longitudinally and rotatively adjustable indicating member provided with a nut engaging said rod and a portion engaging said member for automatically and gradually reducing or increasing the speed of said machine.

5. A speed regulating device for sound recording and reproducing machines comprising in combination, a governor for the machine provided with a braking member, a

constant speed threaded rod operated by the machine, a longitudinally and rotatively adjustable graduated indicating member provided with a nut engaging said rod and a

rod and a portion engaging said member for automatically and gradually reducing or increasing the speed of said machine, and a mounting for said indicator member for guiding the same abreast of said extension.

6. A speed regulating device for sound recording and reproducing machines comprising in combination, a governor for the machine provided with a braking member, a constant speed threaded rod operated by the machine, and a longitudinally and rotatively adjustable indicating member provided with a nut engaging said rod and an arcuate portion engaging said member for automatically and gradually reducing or increasing the speed of said machine, said arcuate member serving to maintain engagement with said braking member when said nut is out of engagement with said rod.

8. A speed regulating device for sound recording and reproducing machines comprising in combination, a governor for the machine provided with a braking member, a constant speed threaded element, and a longitudinally and rotatively adjustable and movable indicating member having a portion engaging said braking member and a nut engaging said element, said indicating member when adjusted to disengage the nut from said element being adapted for longitudinal adjustment to stop the motor, allow it to run free under the governor, or retard the speed to a fixed rate, and serving when adjusted to engage the nut with said element to automatically increase or decrease the speed of the machine.

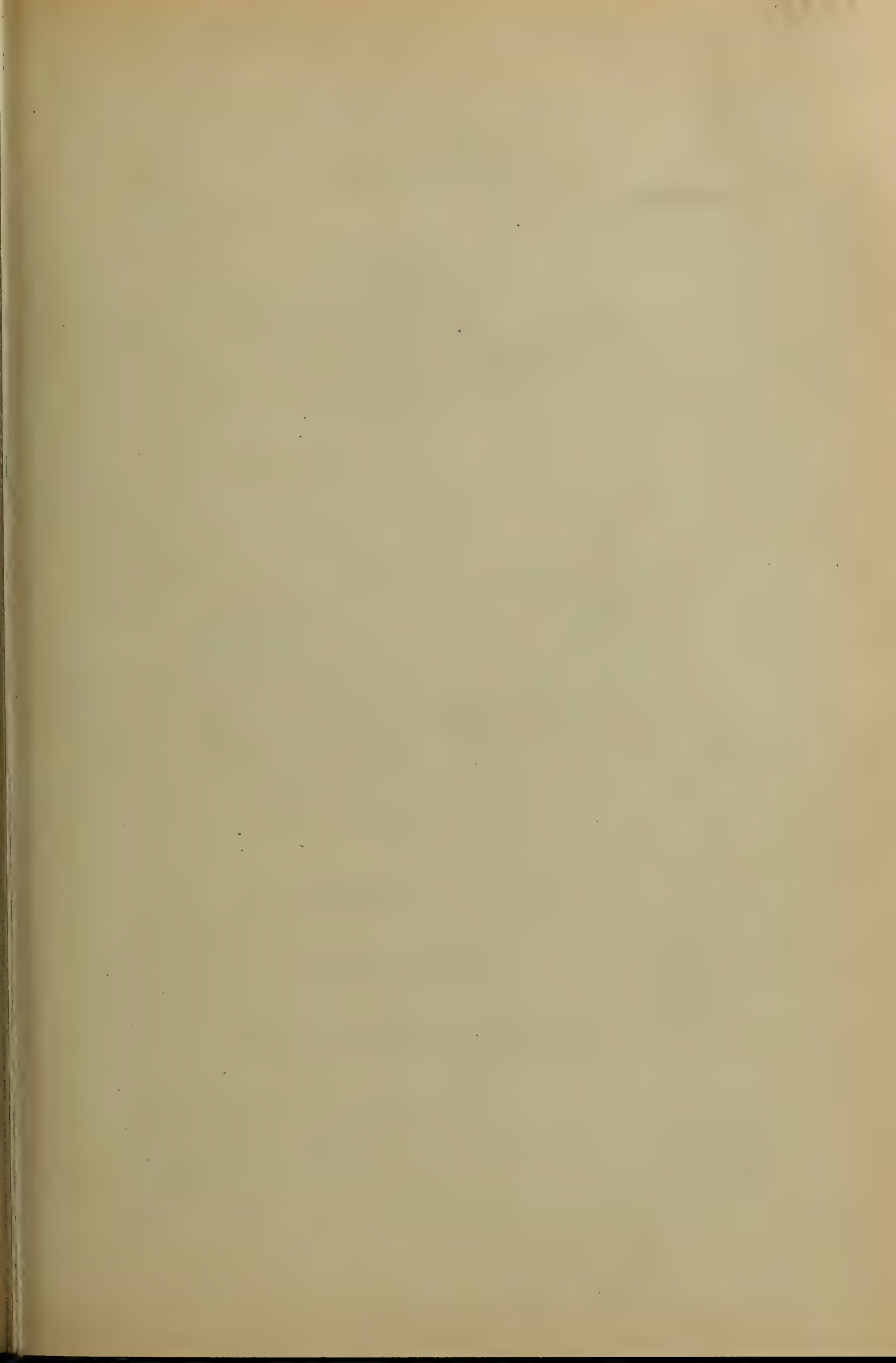
7. A speed regulating device for sound recording and reproducing machines comprising in combination, a governor for the machine provided with a braking member having an extension, a constant speed threaded rod operated by the machine, and a longitudinally and rotatively adjustable indicating member provided with a nut engaging said

In testimony whereof we have signed our names in the presence of two subscribing witnesses.

GEORGE OULTON.
CHARLES ABLETT.
WILLIAM EDWARD LIGHTFOOT

Witnesses:

WILLIAM BIRT KENDRICK,
RIDLEY JAMES URQUHART.

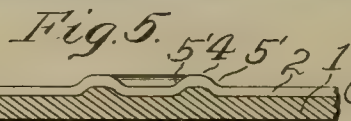
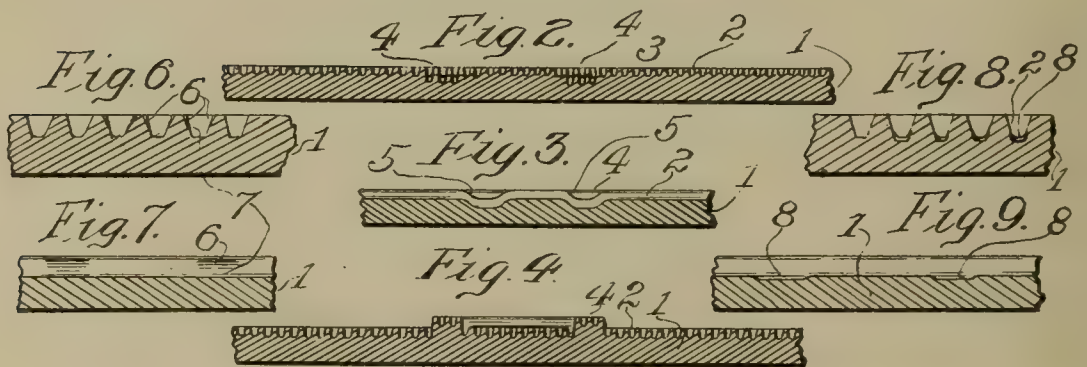


J. W. OWEN.
SOUND RECORD FOR TALKING MACHINES.
APPLICATION FILED AUG. 27, 1907.

964,685.

Patented July 19, 1910

Fig. 1.



INVENTOR

James W. Owen.

BY

Roscoe Pettit

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UNITED STATES PATENT OFFICE.

JAMES W. OWEN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-RECORD FOR TALKING-MACHINES.

964,685.

Specification of Letters Patent.

Patented July 19, 1910.

Application filed August 27, 1907. Serial No. 390,319.

To all whom it may concern:

Be it known that I, JAMES W. OWEN, a citizen of the United States, and a resident of the city of Philadelphia, county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Sound-Records for Talking-Machines, of which the following is a full, clear, and exact disclosure, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to an improved sound record, such as is used on gramophones, graphophones and other sound reproducing machines.

The object of my invention is to produce a commercial record which is difficult to duplicate without impairing or interfering in any manner with the sound recorded thereon.

A further object of my invention is to incorporate into the record portion of a commercial sound record identification marks, words, descriptive matter or other distinguishing characters to designate either the source of origin of the record, or any other information which may be desired, in such a manner that it would be extremely difficult to remove or efface the same without injuring or destroying the record, and at the same time to so place such characters on the recording surface as not to interfere in any manner with the quality of the reproduction.

In the drawings forming a part of this specification in which the same reference character is used to designate the same part throughout the various views, Figure 1 represents a plan view of a disk record, having the sound waves recorded in laterally undulatory grooves of substantially even depth on the face thereof and embodying my invention; Fig. 2 is a transverse fragmentary sectional view and Fig. 3 is a longitudinal fragmentary sectional view of the same; Figs. 4 and 5, 6 and 7 and 8 and 9 are views corresponding to Figs. 2 and 3 but of modified forms of my invention. It is to be understood that Figs. 2 to 9 are on a greatly exaggerated scale.

1 indicates a commercial record having sound waves recorded thereon, as a spiral laterally undulatory groove 2 of even depth forming a record surface 3. In the record surface 3 are formed lines, words or other

characters 4, the same being formed by making the record surface in a different plane from the main or body portion of the record surface. In Figs. 1, 2 and 3 these characters are formed as depressions in the recorded surface, the said depressions being both at the tops of the grooves and also at the bottoms of the same, so that the record grooves 2 are of exactly the same depth in the main or body portion of the record and in the depressed portions. The edges of the depressed portions are not sharp but are rounded or beveled into the main or body portion, as at 5. In Figs. 4 and 5 the characters are formed by raising certain portions of the record surface above the main or body portion of the record in exactly the reverse manner as the characters are formed in the modification above described, and as illustrated in Figs. 1 to 3 inclusive. In this latter modification the characters and the raised portions are of exactly the same depth as the characters in the main and body portion of the record and the edges of the raised portions are beveled as at 5'. In Figs. 6 and 7 the characters are formed by removing portions from the side walls of the sound groove along the upper edges thereof to widen the grooves for distances corresponding to the widths of the portions of the letters to be impressed, as indicated by 6, in these figures. As the stylus point bears upon the lower portions 7 of the side walls of the grooves the action of the stylus is not affected by this slight change in the upper portion of the groove. In Figs. 8 and 9 the characters are formed by removing at proper intervals the lower portions of the groove as indicated at 8, leaving the outer side walls of the grooves and the outer surface of the record intact. As the extent of the elevation or depression in surface of the grooves is but slight, and the edges of the same are rounded or tapered into the normal surface of the bottom of the groove, the action of the stylus which coöperates with the side walls of the groove will not be affected by this change.

From the above it will be seen that I have made a record in which portions of the record surface are in different but parallel planes and that by slightly elevating or depressing portions of both the upper surface of the recorded surface and the portions of the sound groove the depth of the record groove is not varied.

On account of the fact that the surface of both tablet and groove of a commercial record, of the characters above described is smooth and polished, a very slight variation in the plane of the surface of the record is very noticeable, therefore, the distance between the planes of the raised or depressed portions of the record and the main or body portion of the record may be very small indeed and yet give a very marked effect, and it is therefore, obvious that instead of removing portions of the grooves, as shown in Figs. 6 to 9, portions of the side and bottom of the groove extending the full depth thereof might be slightly raised or slightly depressed to obtain the desired effect, without making any noticeable change in the action of the stylus as it is moved by the walls of the grooves. Slight variations in the plane of the surface of the sound record or groove will not effect, in any manner, the reproduction from the record especially if the line of demarkation between the raised or depressed and the main or body portion of the record be beveled off into the main portion of the record, the stylus riding quietly over such depression or elevation of the record groove.

While I have shown my invention as applied to disk records having lateral undulations, it is obvious that it may be applied to records of cylindrical shape or to any other form having lateral or vertical undulations, and I do not limit myself to any particular form of record disk or of undulations. Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:

1. A record provided with a recorded surface having a visual identification character formed in said recorded surface.

2. A record having a recorded surface, consisting of a spiral groove of substantially uniform depth and having lateral undulations corresponding to sound waves, and a visual identification mark impressed into said recorded surface.

3. A record comprising a surface having undulations thereon corresponding to sound waves, and having a portion of said surface displaced vertically with reference to the surrounding portions of said recorded surface without phonetically affecting the reproduction of the recorded sound.

4. A record provided with undulatory grooves on one surface, and visual identification marks distinct from the said grooves located upon the surface occupied by the said grooves.

5. A record having a recorded surface consisting of a groove of substantially uniform depth, and having undulations corre-

sponding to sound waves and visual marks which do not phonetically affect the record located upon said recorded surface.

6. A record provided with a recorded surface and having portions of said surface displaced in a plane substantially parallel to the plane of the surrounding portions of said surface.

7. A record having a visual character located upon the recorded surface thereof.

8. A record provided with a recorded surface and having marks located upon said recorded surface, the surface between said marks and said recorded surface being beveled to avoid the production of sound by the passage of the needle along said recorded surface.

9. A record comprising a surface having undulatory grooves thereon corresponding to sound waves, and having portions of said surface displaced with reference to the surrounding portions of said surface, the surface between said portions being beveled in the direction of said grooves to avoid the production of sound by the passage of the needle along the grooves.

10. A record having a visual mark located upon the recorded surface thereof, and extending over a plurality of adjacent convolutions of the record groove.

11. A sound record having an identification mark upon the recorded surface thereof, which will not substantially acoustically affect the stylus.

12. A record provided with a recorded surface, portions of which recorded surface are displaced relative to adjacent portions of said recorded surface without substantially altering the depth of the record groove.

13. A sound record having a recorded surface, a portion of which recorded surface is elevated relative to adjacent portions of said surface without substantially changing the phonetic character of the record groove.

14. A sound record having a recorded surface provided with a record groove, portions of which recorded surface together with said groove are elevated relative to adjacent portions of said recorded surface.

15. A sound record having an identification mark impressed into the recorded surface.

In witness whereof I have hereunto set my hand this 26th day of August, A. D. 1907.

JAMES W. OWEN.

Witnesses:

A. I. GARDNER,
ALEXANDER PARK.

J. W. OWEN.

METHOD OF MAKING SOUND RECORDS AND THE MATRICES FOR MAKING SOUND RECORDS.

APPLICATION FILED MAY 4, 1908.

964,686.

Patented July 19, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



Fig. 4.



Fig. 2.



Fig. 5.



Fig. 3.



Fig. 6.



Fig. 7.



Fig. 9.

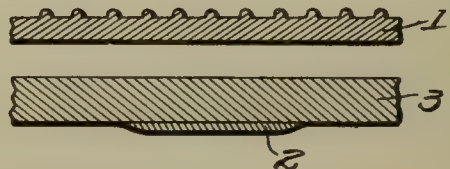


Fig. 8.



Fig. 10.

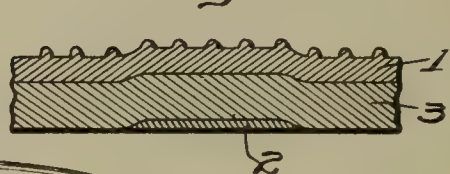


Fig. 11.

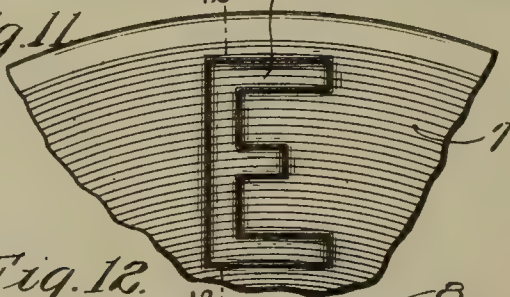


Fig. 12.



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METHOD OF MAKING SOUND RECORDS AND THE MATRICES FOR MAKING SOUND RECORDS.
APPLICATION FILED MAY 4, 1908.

964,686.

Patented July 19, 1910.

2 SHEETS—SHEET 2.

Fig. 13.

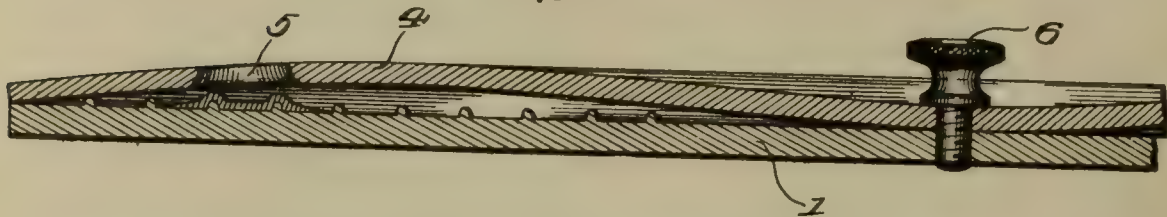


Fig. 14.



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METHOD OF MAKING SOUND-RECORDS AND THE MATRICES FOR MAKING SOUND-RECORDS.

964,686.

Specification of Letters Patent.

Patented July 19, 1910.

Application filed May 4, 1908. Serial No. 430,657.

To all whom it may concern:

Be it known that I, JAMES W. OWEN, a citizen of the United States, and a resident of the city and county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in the Method of Making Sound-Records and the Matrices for Making Sound-Records, (Case A,) of which the following is a full, clear, and exact disclosure.

The object of my invention is to produce a commercial sound record which cannot easily be duplicated or dubbed without impairing or injuring the sound record formed thereon, or incorporating into such duplicates the marks formed on the original records.

A further object of my invention is to form upon the recorded portion of commercial sound records and into the recorded portion of the matrix, from which such records are made, identification marks, words, characters, or other distinguishing marks which it may be desirable to incorporate into the body portion of the record, in such a manner as to make it extremely difficult if not impossible, to remove such marks or words or characters without injuring or destroying the record of the sound, and a further object of my invention is to form such words, or characters or other marks in the recorded portion of the record, in such a manner as not to interfere in any manner with the reproducing qualities of the record.

Other objects of my invention will appear in the specification and claims below.

My invention relates to a process or method of producing or making sound records with marks, characters, letters, words, or other suitable marks, especially upon the recorded part or portion of the record, without interfering in any manner with the reproduction of sound from the record, and when, in the specification or claims, I use the words "recorded part or portion of the record", I mean the whole or any part of the surface of the tablet, or the matrix from which the tablet is formed, bounded by the beginning and the end of the record groove or ridge, including any portion of the tablet between the grooves or ridges, or any portion of the surface or sides, or tops, or bottoms of the grooves, or ridges forming the sound record either in the tablet or in the matrix from which such record is produced.

In the usual process of making records, a master record is first made by placing a record blank on a sound recording apparatus, and causing a record stylus to vibrate in accordance with the sounds which it is desired to record, the stylus cutting or tracing or impressing a generally spiral groove having undulations therein corresponding to sound waves in said blank. After the master record has been made, a copper shell is then usually formed by dusting the surface of the master record with a conductive material, such as graphite, and depositing copper electrolytically on this surface. After a sufficient amount of copper has been deposited the shell is stripped from the matrix and the shell will have ridges in its face corresponding to the grooves in the master record. The shell is then backed up to form a matrix, which is usually plated with nickel to preserve it. Commercial records may then be made from this matrix by impressing the matrix upon a record blank of impressible material, or by flowing a liquid which will afterward congeal over the surface of the matrix. Usually, however, the records are formed by the pressing process above referred to. My method contemplates the placing the reverse of the desired mark or marks upon the recorded portion of the matrix, to which reference has been made above.

In carrying out my method, I preferably first make a master record, and take a negative or shell from this master record electrolytically in the manner above indicated. I then preferably form a negative or reverse of the desired mark upon the recorded surface of the shell. This step of marking the shell may be performed in a variety of ways, a number of which are indicated diagrammatically in the drawings forming a part of this specification, and in which the same reference characters are used through the various views to designate the same structure.

Figures 1 to 3 indicate the various steps of one method of carrying out my invention; Figs. 4 to 6 indicate a modification of my invention; Figs. 7 and 8 indicate another modified manner or order of steps which may be employed in carrying out my invention; and Figs. 9 and 10 a still further method or manner of carrying out my invention. Fig. 11 in-

indicates a portion of a sound record having the marks incorporated within the recorded portion of the record in accordance with my invention; Fig. 12 indicates a section on an enlarged scale on the line 12—12 of Fig. 11, of a record marked in accordance with my invention; Fig. 13 indicates a section of a matrix having secured to the face thereof a stencil, by means of which marks may be placed upon the matrix, and Fig. 14 is a plan view of such stencil.

Referring to the drawings, 1 indicates on an enlarged scale a section of a shell formed from a master record by an electroplating or other suitable process; 2 indicates a deposit of a suitable material, in the form of distinguishing marks, letters, characters or other marks as may be desired; 3 indicates the backing to which the shell is united.

One manner of carrying out my invention is as follows: A stencil 4 having openings 5 therein corresponding to the marks which it is desired to form upon a finished record is placed over one of the faces or surfaces of the shell, and secured thereto by a thumb screw 6. The shell and stencil are then immersed in an electroplating bath, and a deposit of metal is made upon the shell through the opening 5 of the stencil. Fig. 13 illustrates the stencil as applied or as covering the recorded portion of the shell, and a thin deposit of a suitable metal, such as copper, formed upon the face of the shell and over the recorded portion thereof, as above indicated. Figs. 1 to 3 also illustrate the steps by which my method may be carried out. A portion of the recorded portion of the shell is given a thin coating of a suitable material, preferably by an electro depositing process, as above described. The shell having this deposit upon the face thereof is shown in Fig. 2. The shell is then united to the backing in any suitable manner, as by the sweating process, which consists in heating the backing 3 and flowing a solder over the surface thereof, and then soldering the shell to the backing under pressure, an elastic sheet or cushion, as for instance asbestos being placed between the recorded face of the shell and the adjacent pressing plate. The shell having the marks upon the recorded portion thereof and united to the backing is shown in Fig. 3. It is obvious, however, that in carrying out the steps the shell and the backing may be united before the mark is deposited upon the recorded portion of the shell. In Figs. 4 to 6 is outlined the similar process of forming marks upon the matrix, but in this instance the deposit is formed upon the back of the shell, as shown in Fig. 5. The shell is then united to the backing by the sweating process, that is to say soldered under pressure, and with a suitable elastic cushion over the recorded portion of the shell. This

cushion is preferably made of asbestos. The shell and backing are then united under a high pressure with the result that the mark formed upon the back of the shell is pressed through the shell and appears as an elevation on the recorded portion of the shell, as plainly indicated in Fig. 6. In Figs. 7 and 8 is another modified form, but in this instance the deposit is formed first upon the face of the backing, and then when the shell is united to the backing under great pressure, the deposit between the shell and the backing appears as an elevation on the face of the shell, as clearly indicated in Fig. 8. In Figs. 9 and 10 the deposit is formed upon the back of the backing, and when the shell and backing are united under a high pressure, the deposit is pressed up into the backing through the backing, and also through the shell, and similarly appears on the face of the record.

It is, of course, desirable that the mark should not form any sharp edge upon the recorded surface of the record, otherwise there might be a noise or a click heard during the reproduction of sound as the stylus passes over the elevated or depressed portion of the record. I find that a tapering deposit, that is to say a deposit which at its edges is infinitesimal, and of increased thickness toward the middle or central part of the deposit may be formed by making the stencil slightly dished or concave on the side adjacent the record, so that the stencil does not lie in absolute contact with the recorded portion of the record. This is illustrated on a greatly exaggerated scale in Fig. 13. I also find that by making the holes 5 through the stencil flaring with the largest diameter on the side adjacent the shell, a similar result is obtained. In this way I substantially make an elevation on the face of the shell, the edges of the elevation being tapered into the surrounding surface.

With a matrix formed in any of the manners above indicated, the record formed thereon will have corresponding marks formed upon its surface, but the marks will, of course, be reversed to those formed in the matrix, that is to say if the marks be built up upon the shell or matrix they will be depressed in the commercial record. It is further obvious that the marks themselves may be relatively depressed into the surface of the matrix by exposing substantially the whole of the shell or matrix to the action of the electrolytic bath, and protecting that portion which is to form the marks in the finished matrix or record. It is obvious that the term mark or depression or elevation or interruption is a relative one in this connection.

Whenever the deposit is made between the adjacent surfaces of either the shell or the backing, and the shell is first placed upon

the backing, it is obvious that certain portions of the shell are supported and certain portions of the shell are unsupported. When the shell is united to the backing under pressure as by the sweating process the unsupported portion of the shell is pressed down against the adjacent part of the surface of the backing or conversely the elevations between the shell and the backing are pressed through the shell. In both cases the marks appear as elevated or depressed portions of the face of the shell or of the surface of the ultimate matrix.

As in the ordinary methods of forming matrices the whole matrix when completed is preferably given a complete coating of some protective material such as nickel, in order to prevent any rusting or deterioration of the surface of the matrices.

From the above, it will be apparent that when the stencil is placed over the recorded surface of the shell or matrix, as illustrated in Fig. 13, and the whole is immersed in an electroplating bath, a thin deposit of metal will be formed on that portion of the surface of the shell or matrix which is exposed through the openings in the stencil, but the deposit will be infinitesimal in thickness around the edges of the deposit and will gradually build up or increase in thickness toward the central portion of the deposit. This deposit will form an interruption in the surface of the shell or matrix, but the continuity of the surface will not be broken or interrupted and the height of the record of the sound forming the recorded surface, that is to say, the height of the sound ridge or the depth of the sound groove will be substantially constant or unchanged. I, therefore, form by the above process, an elevation on the recorded surface of the matrix or shell, but the height or depth of the record of the sound will remain unchanged, and the surface will gradually rise from the adjacent surface and sink again into it. It will also be apparent that when I make the deposit directly upon the face of the shell and when I make a deposit upon one of the adjacent surfaces of the shell and backing or even upon the back of the backing and press the deposit through to the recorded surface or face of the shell, I form a substantially vertical displacement of a portion of the surface with respect to the adjacent surface with the result that marks will appear upon the recorded surface of the matrix and, consequently, in the recorded surface of the commercial record pressed therefrom. It will also be understood that the drawings forming a part of this specification are on a greatly exaggerated scale and in practice the thickness of the deposit is very small and the displacement of the recorded surface is correspondingly small. Inasmuch as the surface of the matrix is

very smooth and the surface of the commercial sound records is also smooth and highly polished, this slight vertical displacement of a portion of the surface is very apparent to the eye and looks to be greater than it actually is. Consequently, when the elevated or depressed portion of the face of the matrix or shell or commercial record pressed therefrom is given a definite contour, such as being made in the form of a trade-mark or letters, or any other distinguishing mark, such mark appears very plainly upon the finished record, as well as upon the matrix, while the stylus traversing the record groove will ride smoothly over the elevation or depression forming the mark above described, but without the production of any sound other than that originally recorded on the matrix. The mark itself, or the elevation, or depression, itself, will not phonetically affect the stylus.

In Figs. 11 and 12 is illustrated a portion of a finished record 7 having a mark 8 depressed within the recorded surface thereof, the groove 9 within the depressed portion 8 is not interrupted and the normal recorded surface is gradually tapered into the depressed portion, this result being effected by the tapering edges of the deposit 3 on the matrix.

For the purpose of briefly defining the manner in which portions of the surface of the shell and the surface of the matrix and surface of the record formed therefrom are made and to describe the character of the marks formed thereon, I have employed the word "displacing" and "interrupting" to describe the manner in which the mark differs or varies from the surrounding portion of the surface of the shell or matrix or record, and I intend these expressions to cover the depositing or building up or depressing or elevating of certain portions of the record with respect to other portions of the surrounding surface, and the marks which I form in carrying out my invention as set forth and described in my above specification are intended to all fall within the definitions I have above given.

While I have described a method of marking records, which method is preferably carried out by an electrodeposition method, any other manner of forming, or elevating, or depressing marks or forming interruptions in the recorded surface of the record, or of the matrix, or of the shell is fully contemplated by me so long as the marks therein formed do not in any wise interfere with the reproduction of sound.

Having thus fully described my invention what I claim and desire to protect by Letters Patent of the United States is:

1. The method of making records with marks on the recorded surface thereof, which consists in forming reverses of the

marks on the recorded portion of the shell containing the reverse of the record grooves, backing the shell and making an impression of the matrix thus formed on a record blank.

2. The method of making records with marks on the grooved surface thereof, which consists in making a master record, taking an impression of said record by the electrotyping process, covering the metallic shell thus formed with an insulating stencil having marks cut therein, electroplating through the stencil, backing the shell, and making an impression of the matrix thus formed upon a record blank.

3. The method of making records with marks on the grooved surface thereof which consists in making a master record, taking an impression of said record by the electrotyping process, covering the metallic shell thus formed with an insulating stencil slightly dished on its contacting surface and having marks cut therein, electroplating through the stencil, backing the shell and making an impression of the matrix thus formed upon a record blank.

4. The method of making records with marks on the grooved surface thereof, which consists in making a master record, taking an impression of said record by the electrotyping process, forming reverses of the said marks on the shell thus obtained, backing the shell and making an impression of the matrix thus formed upon a record blank.

5. The method of making records with marks on the grooved surface thereof, which consists in making a master record, taking an impression of said record by the electrotyping process, forming reverses of the said marks on the shell thus obtained, covering the record surface of said shell with a sheet of elastic material and sweating said shell upon a backing plate under pressure.

6. The method of making records with marks on the grooved surface thereof, which consists in making a master record, taking an impression of said record by the electrotyping process, forming reverses of the said marks on the shell thus obtained, covering the record surface of said shell, with a sheet of elastic material, sweating said shell upon a backing plate by pressure, and making an impression from the matrix thus formed upon a record blank.

7. The method of making records with marks on the grooved surface thereof, which consists in forming reverses of the marks on the grooved portion of the matrix containing a reverse of the record, and impressing the matrix into a record blank.

8. The method of making records with identification marks on the grooved surface thereof, which consists in forming reverses of the marks on the grooved portion of the matrix containing the reverse of the record

and without substantially changing the depth of the grooves, and impressing the matrix into a record blank.

9. The method of making a record having identification marks on the grooved surface thereof, which consists in recording the sound on a record blank, making an electrotype shell therefrom, changing the relative height of portions of the recorded surface on said shell without changing the depth of the groove, and then impressing the same into a plastic record blank.

10. The method of making records with identification marks on the recorded surface thereof, which consists in forming reverses of said identification marks on the recorded portion of the matrix containing the reverse of the record, and forming a record from said matrix.

11. The method of making records with marks on the recorded surface thereof, which consists in forming reverses of the marks on the recorded portion of the shell containing the reverse of the record groove, backing the shell and making an impression of the matrix thus formed on the record blank.

12. In the method of making records with marks on the recorded surface thereof, the process which consists in producing a matrix from the master record and forming the desired marks on the recorded surface of the said matrix.

13. The method of making a sound record matrix which consists in forming an interruption of predetermined configuration in the recorded surface of a shell and uniting the shell with a backing.

14. The method of making a matrix with marks on the recorded surface thereof, which consists in forming a shell from the master record, forming interruptions of predetermined configuration on the recorded surface of said shell.

15. The method of making a matrix with marks on the recorded surface thereof, which consists in forming a shell from the master record, forming elevations corresponding to desired marks on the recorded surface of said shell and uniting said shell to a backing plate.

16. The method of making a sound record matrix, which consists in forming an interruption of predetermined configuration on the recorded surface of the matrix.

17. The method of making a sound record matrix, which consists in forming an elevation of predetermined configuration on the recorded surface of the shell, and uniting the shell to a backing.

18. The method of marking a sound record matrix, which consists in substantially perpendicularly displacing a portion of the recorded surface of said matrix relatively to the adjacent portions of said surface.

19. The method of making a sound record matrix having marks upon the recorded surface thereof, which consists in displacing substantially perpendicularly a portion of said recorded surface relatively to the adjacent portions of said recorded surface.

20. The method of forming a sound record matrix with marks distinct from the grooves or ridges upon the recorded surface thereof, which consists in displacing a portion of said recorded surface substantially perpendicularly relatively to the adjacent portions of said recorded surface without changing the relative height or depth of the record of sound thereon.

21. The method of forming a sound record matrix with marks upon the recorded surface thereof which consists in perpendicularly displacing a portion of said recorded surface with reference to the adjacent portions of said recorded surface without interrupting the continuity of said surface.

22. The method of forming identification marks upon a sound record matrix, which consists in forming an electrodeposit upon a portion of the recorded surface of said matrix.

23. The method of forming a sound record matrix, which consists in elevating a portion of the recorded surface by electrically depositing a metal thereon without changing the relative height or depth of the sound record forming said recorded surface.

24. The method of forming a sound record matrix, which consists in depositing upon the recorded surface of the matrix a thin layer of metal, the edges of said deposit being infinitesimal in thickness and increasing in thickness toward the center of said deposit without substantially changing the height of the sound record forming the recorded surface of said matrix.

25. The method of marking a sound record matrix, which consists in making a master record, forming a metal shell therefrom, covering a portion of said shell with a stencil and subjecting said shell to the action of an electroplating bath.

26. The method of marking a sound record matrix, which consists in making a master record, forming a metal reverse thereof, protecting a portion of the surface of said reverse with a non-conductor and

subjecting said reverse to the action of an electroplating bath.

27. The method of marking a matrix, which consists in covering a portion of the surface of said matrix with a non-conductor of electricity and electroplating the exposed surface of said matrix.

28. The method of marking a sound record matrix, which consists in covering a portion of the recorded surface of said matrix with a non-conductor of electricity and electroplating the uncovered portions of said recorded surface.

29. The method of making records with marks on the recorded surface thereof, which consists in forming a metal reverse of the master record, covering a portion of the recorded surface of said reverse with a non-conductor of electricity, plating the uncovered portions of said reverse and forming a record from said reverse.

30. The method of marking a matrix, which consists in forming a shell by the electroplating process, covering said shell with a stencil, the openings in said stencil being undercut with relation to said record and electroplating the exposed portion of said shell.

31. The method of marking a sound record matrix, which consists in forming a shell and covering said shell with a stencil, said stencil being slightly removed from the surface of said shell adjacent the openings in said stencil and electroplating the portion of said shell exposed through said openings.

32. The method of marking a sound record matrix, which consists in forming a shell, placing a stencil over the recorded side of said shell with an opening in said stencil over a portion of the recorded surface of said shell and electroplating the exposed portion of said recorded surface.

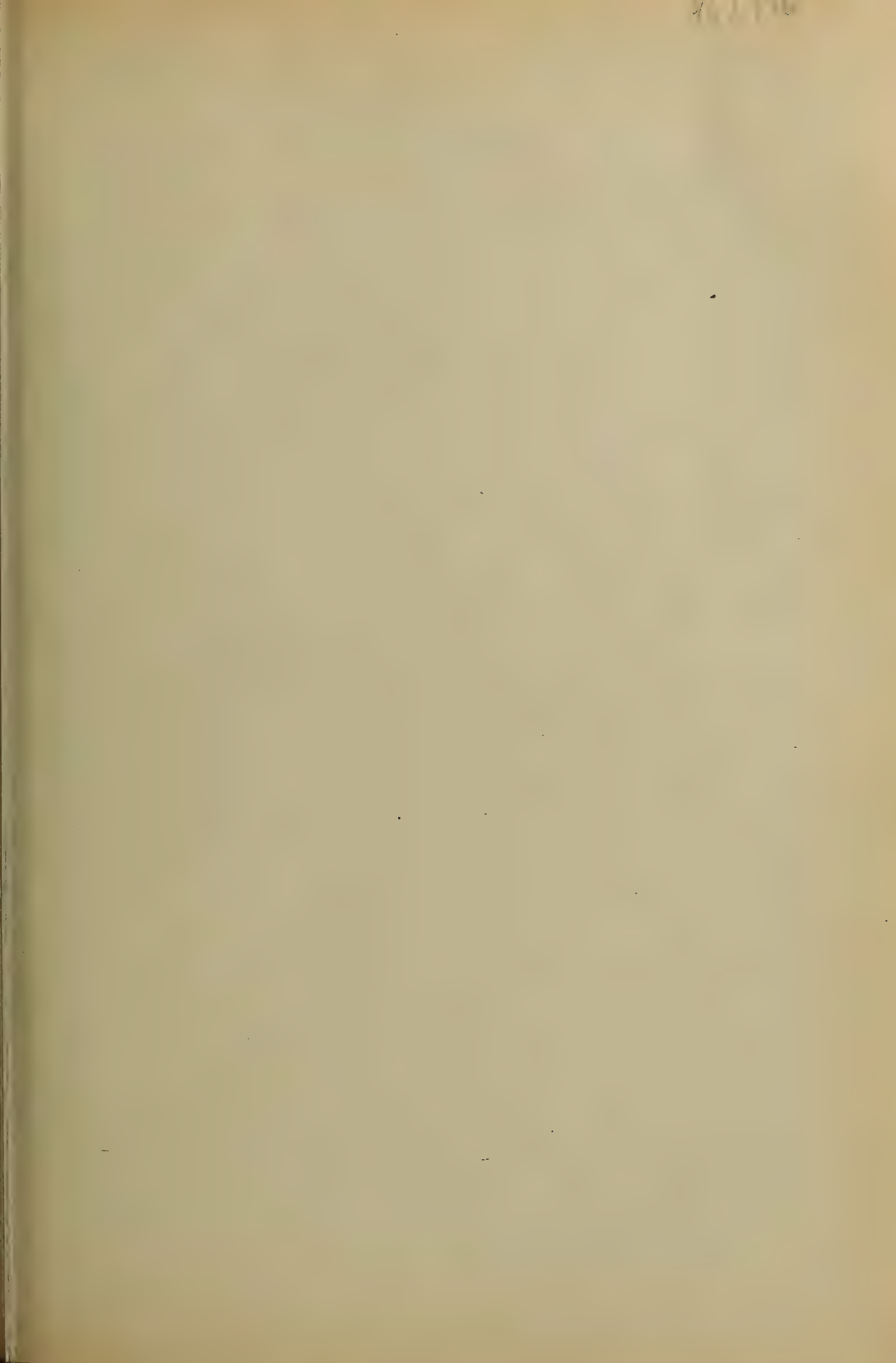
33. The method of marking a sound record matrix, which consists in placing a stencil over said matrix with an opening in said stencil, exposing a portion of the recorded surface of said matrix and depositing a metal on said exposed surface.

In witness whereof I have hereunto set my hand this 2nd day of May A. D. 1908.

JAMES W. OWEN.

Witnesses:

ALSTON B. MOULTON,
ALEXANDER PARK.



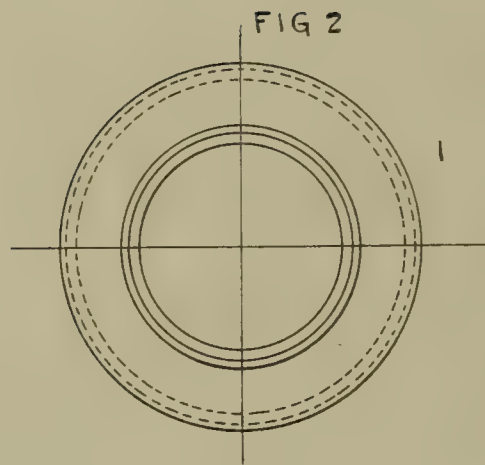
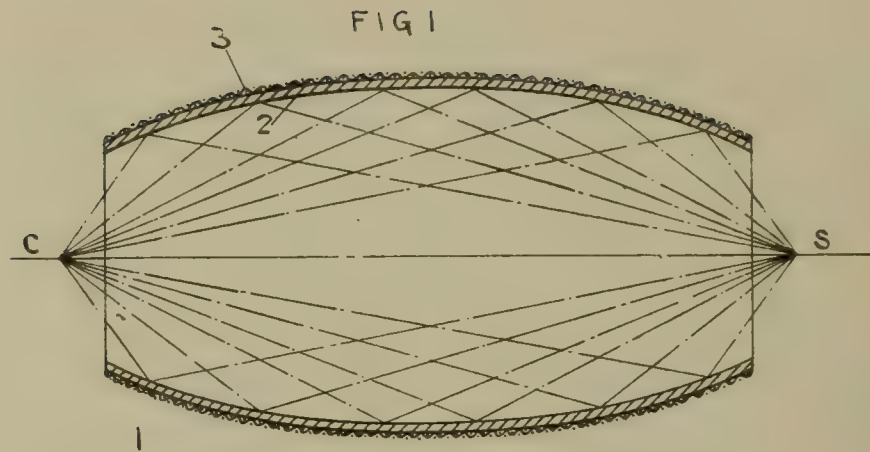
S. I. PRESCOTT.

TRANSMITTER FOR SOUND RECORDING AND REPRODUCING MACHINES.

APPLICATION FILED MAR. 18, 1909.

965,326.

Patented July 26, 1910.



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TRANSMITTER FOR SOUND RECORDING AND REPRODUCING MACHINES.

965,326.

Specification of Letters Patent.

Patented July 26, 1910.

Application filed March 18, 1909. Serial No. 484,281.

To all whom it may concern:

Be it known that I, SYDNEY I. PRESCOTT, a citizen of the United States, residing at Camden, county of Camden, in the State of New Jersey, have invented a new and useful Transmitter for Sound Recording and Reproducing Machines, of which the following is a specification.

This invention relates to a transmitter for sound recording and reproducing machines.

Heretofore, hollow sound conductors have been used which varied widely in form. Certain types of these conductors were tubular and of even diameter. In certain other types the diameter of the tube varied. In the latter type, one end of the conductor was larger than the other, so that sound, in passing therethrough from the smaller end toward the larger, would be amplified. In both types the sound-wave in passing through the tube is deformed, the deformation depending upon the material of which the tube is constructed, its shape, and upon the fact that the sound-waves are deflected from the walls of the conductor and forced to meet on the axial line of the same, thereby producing crashes of sound. Furthermore, sound conductors heretofore used, the wall of which was formed of vibratory material, produced a secondary set of sound-waves in the air surrounding the conductor. These secondary sound-waves were never the same as the sound-waves passing through the conductor, for the reason that the frequency of vibration of the conductor wall was not the same as the frequency of the air vibration within the conductor, and that in consequence the frequency of the secondary sound-waves was the resultant of the combined forces and unlike either. The presence of secondary sound-waves is objectionable for they detract from the purity of the initial sound.

Where it is necessary to conduct a sound-wave from one point to another, it is desirable that the wave at the delivery point be not deformed. Furthermore, in certain instances where sound recording and reproducing machines are used, it is highly desirable to concentrate the sound at a predetermined point without deformation of the wave.

It is one of the objects of this invention, therefore, to provide a hollow conductor for sound recording and reproducing ma-

chines, the purpose of which is to concentrate the sound-waves passing therethrough at a predetermined point.

A further object is to provide means for producing concentration at a predetermined point of sound-waves passing through a conductor in their initial purity.

A further object is to provide a sound conductor backed by sound-absorbing material so that no secondary sound-waves are produced in the air surrounding the conductor.

Still another object is to provide means for conducting sound-waves from one point to another without producing sound crashes which detract from the purity of the sound.

With these and other objects not specifically mentioned, in view, the invention consists in certain constructions which will be hereinafter fully described and then specifically pointed out in the claims hereunto appended.

In the drawings which form a part of this specification and in which like characters of reference indicate the same parts, Figure 1 is a longitudinal section of a device constructed in accordance with the invention, and Fig. 2 is a cross sectional view of the device illustrated in Fig. 1.

In carrying the invention into effect, there is provided a hollow conductor, the wall of which is shaped to cause concentration of sound-waves passing therethrough at a predetermined point beyond the limits of the conductor, and this conductor may vary widely in shape or form, the shape or form depending upon the relative position of the source of sound, and the predetermined point at which it is to be concentrated. In the best constructions, and as shown, this conductor, marked 1, is circular in cross section, and of varying diameter. The conductor 1 is paraboloidal in shape, its walls being formed to cause concentration of the sound-waves at a predetermined point on the axial line of the conductor.

In the device illustrated, S indicates the source of sound and the broken lines within the conductor indicate a number of sound-wave increments and their course therethrough, the point of concentration being marked C. It is obvious that the conditions may be reversed and sound transmitted from C to and concentrated at S. It is obvious also that the sound-waves in passing through

the conductor will not cross its axial line and that, therefore, there will be no sound crashes produced which detract from the initial purity of the sound. The inner wall
5 of the conductor, marked 2, is, in the best constructions, formed of a hard deflecting material. Any suitable material such as metal or glass may be used for this purpose.

When it is desired to prevent the propagation of secondary sound-waves from the outside of the conductor, the wall of the same is, in the best constructions, backed by sound-absorbing material 3 which may vary widely in character. Velvet or plush has been
10 found suitable for this purpose. By the use of material of this nature the secondary sound-waves which are produced by the hard deflecting walls of the conductor, are absorbed within the body of the backing,
15 and no secondary sound-waves are propagated in the air.

When the source of sound and point of concentration occupy the relative positions indicated in the device illustrated, the conductor will progressively increase in diameter toward the center, as is clearly shown in the drawing.

Changes and variations may be made in the device by which the invention is carried
25 into effect. The invention is not, therefore,

to be restricted to the precise details of construction illustrated and described.

What is claimed is:

1. A hollow conductor for sound recording and reproducing machines, the wall of which
35 is formed of a hard deflecting material backed by sound absorbing material and shaped to cause concentration of sound waves passing therethrough at a predetermined point, substantially as described. 40

2. A hollow paraboloidal conductor for sound recording and reproducing machines, the wall of which is formed of a hard deflecting material backed by a sound absorbing material and shaped to cause concentration of sound waves passing therethrough
45 at a predetermined point beyond the limits of the conductor, substantially as described.

3. A hollow conductor for sound recording and reproducing machines the outer wall
50 of which is formed of a sound absorbing material, substantially as described.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

SYDNEY I. PRESCOTT.

Witnesses:

FRANK B. MIDDLETON, Jr.,
ETHEL M. WHITEHEAD.

S. I. PRESCOTT.
SOUND TRANSMISSION.
APPLICATION FILED MAR. 18, 1909.

965,327.

Patented July 26, 1910.

FIG 1

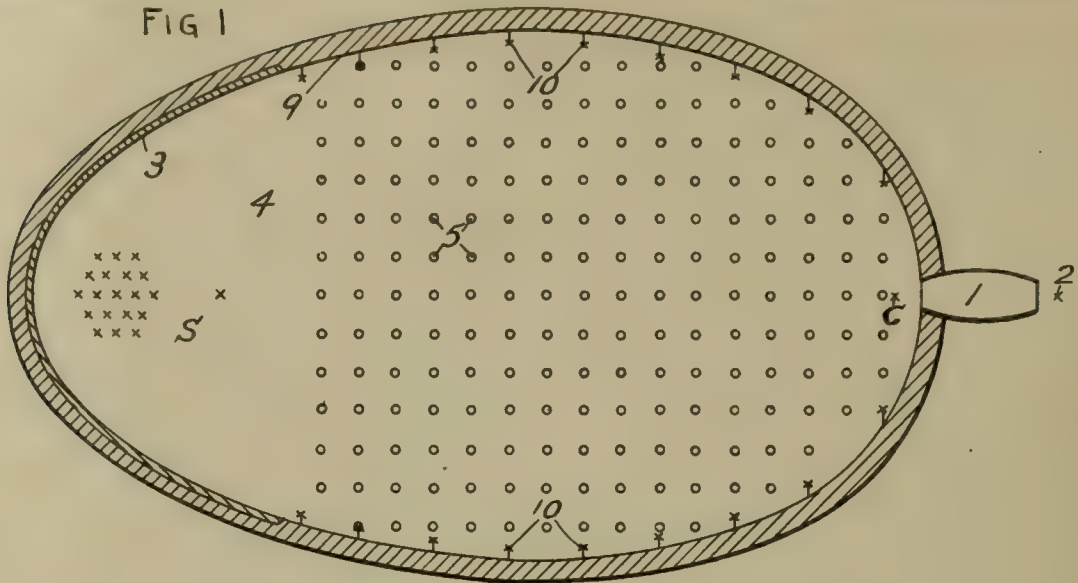


FIG 2

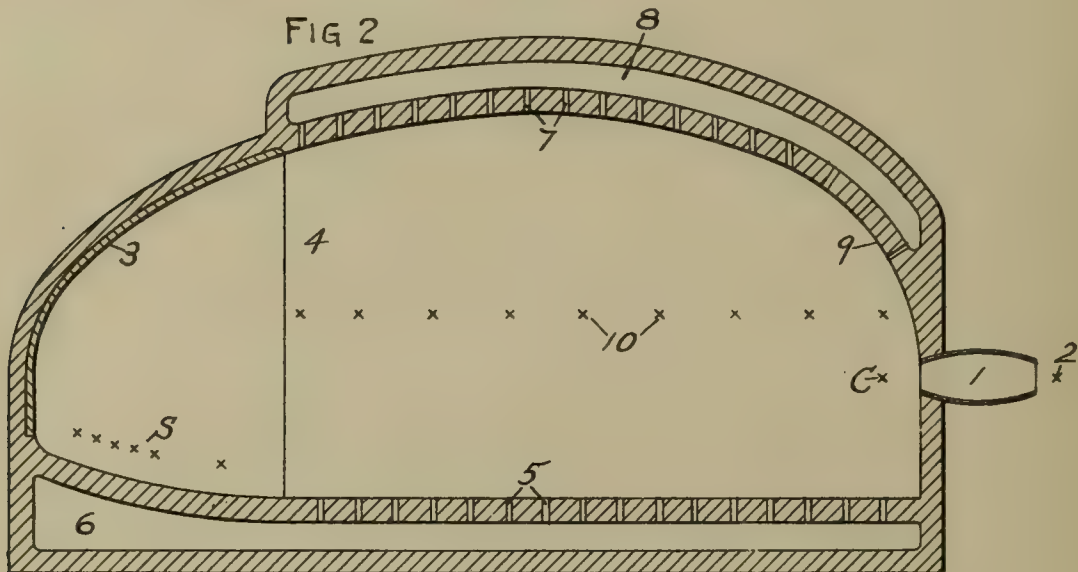
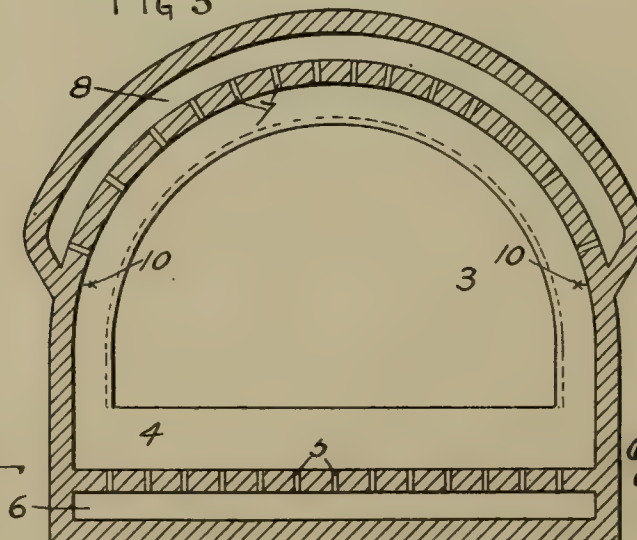


FIG 3



ATTEST
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SOUND TRANSMISSION.

965,327.

Specification of Letters Patent.

Patented July 26, 1910.

Application filed March 18, 1909. Serial No. 484,283.

To all whom it may concern:

Be it known that I, SYDNEY I. PRESCOTT, a citizen of the United States, residing at Camden, county of Camden, in the State of New Jersey, have invented a new and useful Improvement in Sound Transmission, of which the following is a specification.

This invention relates to an improvement in sound transmission, particularly to sound transmission as applied in the art of recording sound.

It is well known that sound in passing from one medium to another, or in passing from one stratum to another of the same medium, is refracted and that the propagation of the sound wave is, in consequence, interrupted, and in some instances the sound is destroyed. When air is the medium through which the sound travels, a column of heated or otherwise disturbed air occupying a position in the path of the travel of the sound wave forms an acoustic cloud which interrupts the uniform propagation of the sound wave, in some instances deflecting it so that an aerial echo is produced. The presence of these or other disturbances in the air makes the same non-homogeneous and not in the condition best adapted for a uniform propagation of sound waves. In the art of recording sound it is very desirable that the sound be recorded in its initial purity. This cannot be accomplished if the sound is caused to travel through air which is non-homogeneous.

It is one of the objects of the present invention, therefore, to provide means for maintaining the air between the source of sound and the receiver in homogeneity, so that there will be no alteration in the sound, which is detrimental to the same, between the source of sound and receiver, or recording instrument.

In recording sound, as at present practiced, great care is necessary in positioning the source of sound and in positioning the sources of sound, where a plurality is used, in order to attain the desired result. In other words, where the tones of different voices are to be recorded the position of the singers with respect to the conductor and recording instrument, must be different, and in many instances a special sound conductor must be used for a particular voice, otherwise imperfect recording will result. So, in the recording of instrumental music, the position of the different instruments must be

carefully considered and even then special skill is required of the musicians and the recording operator. Furthermore, in the present practice of recording selections which include the tones of the human voice with an accompaniment of one or more instruments, it is necessary for the singer to be positioned much nearer the recording instrument than the accompanying instrument or orchestra. It is usual in such cases to utilize different sound conductors for the singer and the orchestra, the result being that there is no combination of the two sets of sound waves until just before the waves reach the recording instrument or receiver. In singing in an auditorium the singer is usually at a greater distance from the audience than the orchestra, but in all cases before the two sets of sound waves reach the audience they have been thoroughly superposed and combined and the wave reaching the audience is a superposed or combined wave in which, however, the distinct characteristics of the original sound waves have not been destroyed. No such action takes place in the present method of recording. The element of distance which is essential to effect the true combination of the two sets of waves is entirely absent. In the art of recording sound it is highly desirable that the sound recorded possesses the same characteristics as the same sound heard by an audience in an auditorium.

It is one of the objects of this invention, therefore to provide means whereby the several sound waves are superposed and combined in the same way that they are in an auditorium.

The tympanum of the human ear is much more sensitive than a recording instrument and consequently the former will receive as a clear impression a much smaller portion of the sound wave propagated than a recording instrument. In other words, it is necessary in the art of recording sound to utilize a larger portion of the sound wave than that which will produce a clear impression upon the auditory system.

Owing to the fact that a very small portion of the sound wave does not possess sufficient power to operate the recording instrument, it is another object of the present invention to provide means whereby a relatively large portion of the sound wave, or sound waves, is concentrated at a predetermined point with respect to the receiver, so

that there will be sufficient power in the selected portion of the wave to effectively operate the recording instrument.

A further object of the present invention is to provide means for regulating the temperature of the air through which the sound travels in order to maintain it in homogeneity.

Heretofore, it has been found almost, if not quite, impossible, to record sound in the open air. This is due to the fact that the air is not in a homogeneous condition and is affected by the wind, which in itself oftentimes forms an acoustic cloud and other causes of disturbance.

It is a further object of the present invention, therefore, to provide a chamber free from such disturbances across which the sound travels and in which the air is maintained in a homogeneous condition.

Heretofore, considerable trouble has been experienced in recording sound in rooms rectangular or substantially rectangular in form. In such rooms sound crashes and direct echoes are frequently produced, and both detract from the purity of the initial sound, and in some instances prevent recording entirely. Various means have been employed in attempts to overcome the defects of the recording rooms, but none of these rooms are acoustically perfect.

It is another object of the present invention, therefore, to provide a chamber substantially ovoidal in form wherein the formation of sound crashes and echoes is impossible.

The entire sound wave produced cannot, in any case, be recorded.

It is a further object of the present invention, therefore, to provide a chamber having a sound-absorbing surface or wall which will absorb or destroy a portion of the sound wave propagated; that is to say, that portion of the sound wave which is not utilized for recording purposes, is absorbed so that it will not interfere with the selected portion recorded.

With these and other objects, not specifically mentioned, in view, the invention consists in certain combinations and constructions, which will be hereinafter fully described and then specifically set forth in the claims hereunto appended.

In the accompanying drawings which form a part of this specification and in which like characters of reference indicate the same parts, Figure 1 is a sectional plan view of a device constructed in accordance with the invention; Fig. 2 is a longitudinal sectional elevation of the device illustrated in Fig. 1; and Fig. 3 is a cross sectional view.

In carrying the invention into effect there is provided a receiver for the sound, and this receiver may vary within wide limits.

While in some constructions the receiver may constitute an element of the recording instrument, in the best constructions, and as shown, a receiver 1 is provided which acts not only as a receiver for the sound but also as a conductor by means of which the sound is conducted to a recording instrument. In the drawings, the recording instrument is not shown because the details of the construction of the same lies entirely outside the range of the present invention and its illustration is deemed unnecessary to an understanding of the same, and is, therefore, omitted in the interest of brevity and clearness. In the drawings, however, the X marked 2 indicates the position of the impulse receiving element of a recording instrument.

There is provided a source of sound, or sources of sound, indicated by X X at S in the drawing. The source or sources of sound indicate the position of a singer, or an orchestra, or both. When a plurality of sources of sound are used for recording purposes, as for instance, when a song with an orchestral accompaniment is to be recorded, it is necessary that the sound waves propagated from the various sources of sound be superposed and thoroughly combined without destroying the distinct characteristics of each, before they reach the receiver, so that the recorded sound will be the same sound that is heard under like conditions in an auditorium. To effect this combination it is necessary that time be allowed for the sound waves to become superposed and fully combined. In the best constructions, therefore, the sources of sound will be spaced a considerable distance from the receiver 1 before referred to.

It is well known that a recording instrument is less sensitive than the tympanum of the human ear and that, therefore, a relatively large portion of the sound wave, or sound waves, must be utilized when the sound is to be recorded. Owing to the fact that the source or sources of sound and the receiver must be spaced apart a considerable distance and that the area of the receiver is relatively small with respect to the sound wave at a distance from the source or sources of sound, and that at this distance the smaller portion of the sound wave which reaches the receiver will not have sufficient power to operate the recording instrument, it is necessary that means be provided for bringing the recording instrument under the influence of a larger portion of the sound wave, or sound waves, than that which would reach it during the natural propagation of the wave. Means are provided, therefore, for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, and this means may vary within wide limits.

In the best constructions, however, this means will not only cause the concentration of a portion of the sound wave, but of a predetermined selected portion of the sound wave at a predetermined position with respect to the receiver. As shown, this means will cause the concentration of a portion of the sound wave at a point marked C lying between the source of sound and the receiver, although it is to be understood that in some constructions the point of concentration might be otherwise located, as for instance, within the receiver. In the best constructions, the means for causing the concentration of a portion of the sound wave consists in a deflecting surface 3 mounted behind and above the sources of sound S before referred to.

It is well known that the uniform propagation of sound waves may be interrupted by acoustic clouds and that acoustic clouds may be formed by air currents, whether produced by heat or pressure, and various other disturbances. Owing to the fact that the source of sound and the receiver are spaced apart and that the sound waves must pass through the intervening air, it is necessary in order to insure that an uninterrupted sound wave be recorded, that disturbances of the air between the sources of sound and the receiver be prevented. Means are provided, therefore, for maintaining the air through which the sound travels in homogeneity; that is to say, means are provided for preventing any disturbances in the air between the sources of sound and the receiver from interfering with the even propagation and concentration of the sound waves. This means may vary within wide limits. While other means may, in some constructions, be provided for maintaining the air through which the sound travels in homogeneity, in certain constructions this means will include means for regulating the temperature of the air so that no acoustic clouds will be formed by heated air currents between the sources of sound and the receiver. When air regulating means are used, this means will, in the best constructions, be of such a character that it will also prevent any wind disturbances in the air between the sources of sound and the receiver. As shown, the sources of sound are located within a chamber 4, the walls of which will prevent any wind disturbances. For the purpose of regulating the temperature of the air within the chamber 4, the floor of the same is provided with a series of hot-air ducts 5 communicating with a hot-air chamber 6 located below the floor. The hot-air ducts are evenly distributed over the floor of the chamber between the source or sources of sound and the receiver. The ceiling of the chamber is provided with a series of cold-air ducts 7 each in communication with

a cold-air chamber 8 located above the ceiling. It will be readily understood that hot-air entering the chamber at the floor through the ducts 5 will silently rise toward the ceiling, and it will also be readily understood that cold-air entering through the ducts 7 in the ceiling will silently descend toward the floor and that an even temperature in all parts of the chamber will thereby be maintained. It will be further understood that the air within the chamber between the source or sources of sound and the receiver will be free from all air currents of a nature to interrupt the propagation of the sound waves.

When sound is transmitted through the air in a rectangular or substantially rectangular chamber or room, it is well known that sound crashes and echoes are produced at the corners thereof. It is further well known that these sound crashes and echoes interfere seriously with the recording of the initial sound, because the crashes as well as the initial sound are recorded. Means are provided, therefore, for preventing the formation of sound crashes and echoes. In the best constructions, the desired result is effected by making the chamber 4 substantially ovoidal in form, as shown, so that there are no corners to produce sound crashes and no flat surfaces against which the sound strikes to produce echoes.

It is well known that the entire sound wave cannot be recorded and that that portion of the sound wave which is not recorded must be effectually disposed of so that it will not interfere with the selected portion to be recorded. To effect this result, in the best constructions the chamber 4 is provided with a sound-absorbing surface 9 which includes the entire surface of the chamber, except the deflecting surface 3, before referred to. This sound-absorbing surface may be constructed in a manner well known to architects. It will be readily understood that that portion of the sound wave not selected and deflected by the deflecting surface 3 will reach the sound-absorbing surface 9 of the chamber and be there absorbed so that there will be no interference with the concentration of the sound wave at the point of concentration C.

From an inspection of the drawings, it will be readily understood that the sources of sound occupy a position within the chamber, and are located at the smaller end thereof, and that the receiver 1 is located in the wall of the chamber opposite the sources of sound or at the larger end of the chamber, although it is to be understood that the relative positions of the sources of sound and the receiver with respect to the chamber may in some constructions be varied.

There must be light within the chamber.

It is undesirable for acoustic reasons to interrupt either the deflecting surface 3 or the absorbing surface 9 by piercing them with windows, for the glass of the window would form a deflecting surface which would produce an interference with the sound waves. Means are provided, therefore, for lighting the chamber, and in order to prevent the heat from this lighting means interfering with the concentration of the sound wave, the lighting means for the chamber will be located beyond the range of action of the concentrating means, in the best constructions at opposite sides of the chamber, the position of the lights being indicated by the crosses 10. It will be readily understood that the heat from these lights will rise close to the absorbing wall 9 where it cannot interfere with the main sound wave.

In view of the foregoing, a detailed description of the operation of the device is deemed unnecessary, and is, therefore, omitted in the interest of brevity and clearness.

Changes and variations may be made in the structure by means of which the invention is carried into effect. The invention is not, therefore, to be restricted to the precise details of the structure shown and described. Furthermore, certain parts of the invention are capable of use independent of other parts, and such independent use is contemplated.

What is claimed is:

1. The combination with a source of sound, of a receiver, means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, and means for maintaining the air through which the sound travels in homogeneity, substantially as described.

2. The combination with a source of sound, of a receiver, means for causing the concentration of a predetermined selected portion of the sound wave at a predetermined position with respect to the receiver, and means for maintaining the air through which the sound travels in homogeneity, substantially as described.

3. The combination with a source of sound, of a receiver, means for causing the concentration of a portion of the sound wave at a position between the source of sound and the receiver, and means for maintaining the air through which the sound travels in homogeneity, substantially as described.

4. The combination with a source of sound, of a receiver, means for causing the concentration of a predetermined selected portion of the sound wave at a position between the source of sound and the receiver, and means for maintaining the air through which the sound travels in homogeneity, substantially as described.

5. The combination with a plurality of

sources of sound, of a receiver, means for causing the combination and concentration of portions of the sound waves at a predetermined position with respect to the receiver, and means for maintaining the air through which the sound travels in homogeneity, substantially as described.

6. The combination with a plurality of sources of sound, of a receiver, means for causing the combination and concentration of predetermined selected portions of the sound waves at a predetermined position with respect to the receiver, and means for maintaining the air through which the sound travels in homogeneity, substantially as described.

7. The combination with a plurality of sources of sound, of a receiver, means for causing the combination and concentration of portions of the sound waves at a position between the sources of sound and the receiver, and means for maintaining the air through which the sound travels in homogeneity, substantially as described.

8. The combination with a plurality of sources of sound, of a receiver, means for causing the combination and concentration of predetermined selected portions of the sound waves at a position between the sources of sound and the receiver, and means for maintaining the air through which the sound travels in homogeneity, substantially as described.

9. The combination with a source of sound, of a receiver, means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, and means for regulating the temperature of the air through which the sound travels in order to maintain it in homogeneity, substantially as described.

10. The combination with a source of sound, of a receiver, means for causing the concentration of a predetermined selected portion of the sound wave at a predetermined position with respect to the receiver, and means for regulating the temperature of the air through which the sound travels in order to maintain it in homogeneity, substantially as described.

11. The combination with a source of sound, of a receiver, means for causing the concentration of a portion of the sound wave at a position between the source of sound and the receiver, and means for regulating the temperature of the air through which the sound travels in order to maintain it in homogeneity, substantially as described.

12. The combination with a source of sound, of a receiver, means for causing the concentration of a predetermined selected portion of the sound wave at a position between the source of sound and the receiver, and means for regulating the temperature of the air through which the sound travels

in order to maintain it in homogeneity, substantially as described.

13. The combination with a plurality of sources of sound, of a receiver, means for causing the combination and concentration of portions of the sound waves at a predetermined position with respect to the receiver, and means for regulating the temperature of the air through which the sound travels in order to maintain it in homogeneity, substantially as described.

14. The combination with a plurality of sources of sound, of a receiver, means for causing the combination and concentration of predetermined selected portions of the sound waves at a predetermined position with respect to the receiver, and means for regulating the temperature of the air through which the sound travels in order to maintain it in homogeneity, substantially as described.

15. The combination with a plurality of sources of sound, of a receiver, means for causing the combination and concentration of portions of the sound waves at a position between the sources of sound and the receiver, and means for regulating the temperature of the air through which the sound travels in order to maintain it in homogeneity, substantially as described.

16. The combination with a plurality of sources of sound, of a receiver, means for causing the combination and concentration of predetermined selected portions of the sound waves at a position between the sources of sound and the receiver, and means for regulating the temperature of the air through which the sound travels in order to maintain it in homogeneity, substantially as described.

17. The combination with a chamber, of a source of sound within the chamber, a receiver located in one of the walls of the chamber, and means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, substantially as described.

18. The combination with a chamber, of a source of sound within the chamber, a receiver located in one of the walls of the chamber, and means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver within the chamber, substantially as described.

19. The combination with a chamber, of a plurality of sources of sound within the chamber, a receiver located in one of the walls of the chamber, and means for causing the combination and concentration of portions of the sound waves at a predetermined position with respect to the receiver, substantially as described.

20. The combination with a chamber, of a plurality of sources of sound within the

chamber, a receiver located in one of the walls of the chamber, and means for causing the combination and concentration of portions of the sound waves at a predetermined position with respect to the receiver within the chamber, substantially as described.

21. The combination with a chamber, of a source of sound within the chamber, a receiver located in one of the walls of the chamber, means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, and means for maintaining the air within the chamber in homogeneity, substantially as described.

22. The combination with a chamber, of a source of sound within the chamber, a receiver located in one of the walls of the chamber, means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver within the chamber, and means for maintaining the air within the chamber in homogeneity, substantially as described.

23. The combination with a chamber, of a source of sound within the chamber, a receiver located in one of the walls of the chamber, means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, and means for regulating the temperature of the air within the chamber in order to maintain it in homogeneity, substantially as described.

24. The combination with a chamber, of a source of sound within the chamber, a sound-absorbing surface within the chamber, a receiver located in one of the walls of the chamber, and a deflecting surface within the chamber positioned to cause the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, substantially as described.

25. The combination with a chamber, of a source of sound within the chamber, a sound-absorbing surface within the chamber, a receiver located in one of the walls of the chamber, and a deflecting surface within the chamber positioned to cause the concentration of a portion of the sound wave at a predetermined position with respect to the receiver within the chamber, substantially as described.

26. The combination with a chamber having hot-air ducts in its floor and cold-air ducts in its ceiling, of a source of sound within the chamber, a receiver located in one of the walls of the chamber, and means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, substantially as described.

27. The combination with a chamber having hot-air ducts in its floor and cold-air

ducts in its ceiling, of a source of sound within the chamber and beyond the range of action of the air ducts, a receiver located in one of the walls of the chamber and beyond the range of action of the air ducts, and means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, substantially as described.

28. The combination with a chamber having hot-air ducts in its floor and cold-air ducts in its ceiling, of a source of sound at one end of and within the chamber, a receiver located in the wall of the chamber opposite the source of sound, and means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, substantially as described.

29. The combination with a chamber substantially ovoidal in form, of a source of sound within the chamber, a receiver located in one of the walls of the chamber, and means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, substantially as described.

30. The combination with a chamber substantially ovoidal in form, of a source of sound located within and at the smaller end of the chamber, a receiver located in the wall at the larger end of the chamber, and means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, substantially as described.

31. The combination with a chamber having hot-air ducts in its floor and cold-air ducts in its ceiling, of a source of sound at one end of the chamber, and a receiver located at the other end of the chamber, substantially as described.

32. The combination with a chamber having hot-air ducts in its floor and cold-air ducts in its ceiling, of a source of sound at

one end of the chamber, a receiver located at the other end of the chamber, and means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, substantially as described.

33. The combination with a source of sound, of a receiver, and means for maintaining the air between the source of sound and the receiver in homogeneity, substantially as described.

34. The combination with a chamber, of a source of sound within the chamber, a receiver within the chamber, and means for maintaining the air between the source of sound and the receiver in homogeneity, substantially as described.

35. The combination with a chamber, of a source of sound within the chamber, a receiver located in one of the walls of the chamber, means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, and lighting means for the chamber located beyond the range of action of the concentrating means, substantially as described.

36. The combination with a chamber substantially ovoidal in form, of a source of sound within and at the smaller end of the chamber, a receiver located in the wall at the larger end of the chamber, means for causing the concentration of a portion of the sound wave at a predetermined position with respect to the receiver, and lighting means located at opposite sides of the chamber, substantially as described.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

SYDNEY I. PRESCOTT.

Witnesses:

FRANK B. MIDDLETON, Jr.,
ETHEL M. WHITEHEAD.

S. I. PRESCOTT.
AMPLIFIER FOR SOUND REPRODUCING MACHINES.
APPLICATION FILED MAR. 18, 1909.

965,328.

Patented July 26, 1910.

FIG 1

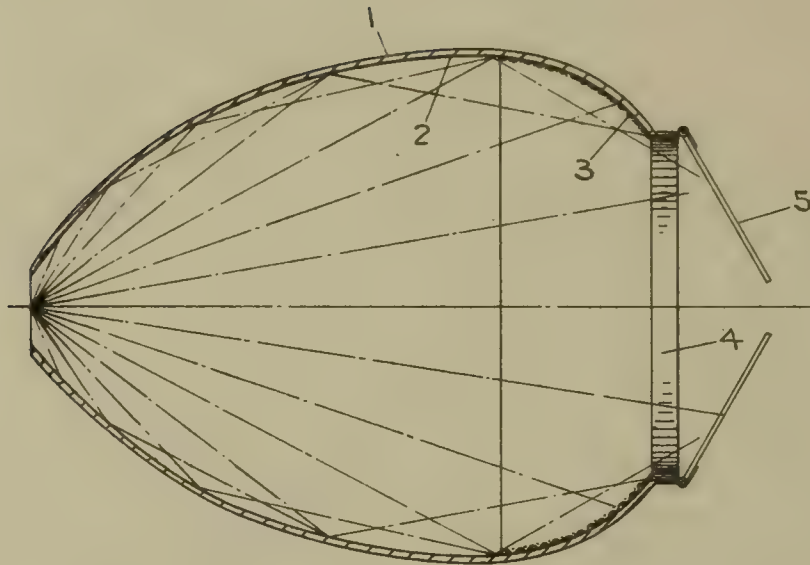
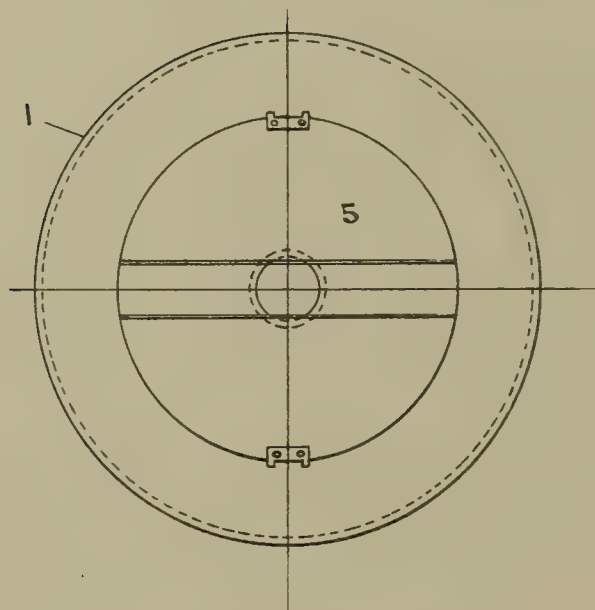


FIG 2



ATTEST
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SYDNEY I. PRESCOTT, OF CAMDEN, NEW JERSEY.

AMPLIFIER FOR SOUND-REPRODUCING MACHINES.

965,328.

Specification of Letters Patent.

Patented July 26, 1910.

Application filed March 18, 1909. Serial No. 484,285.

To all whom it may concern:

Be it known that I, SYDNEY I. PRESCOTT, a citizen of the United States, residing at Camden, county of Camden, in the State of New Jersey, have invented a new and useful Amplifier for Sound-Reproducing Machines, of which the following is a specification.

This invention relates to an improvement in amplifiers for sound reproducing machines.

Heretofore, amplifiers for sound reproducing machines have been constructed in a form progressively increasing in diameter from one end to the other. In such structures there is produced by the deflection of the sound-waves passing therethrough, a series of sound-crashes. Such structures are acoustically imperfect and objectionable for this reason.

It is one of the objects of the present invention to provide an amplifier for sound reproducing machines through which the sound-waves will pass without the formation of internal sound-crashes. It has been found that to be acoustically perfect, a chamber in which sound-waves are propagated should be substantially ovoid or egg-shaped. In order to avoid the production, within such a chamber, of sound jars it is necessary that a portion of the surface be of some non-deflecting or sound-absorbing material.

It is another object of the present invention to provide an amplifier, a portion of the wall of which is capable of deflecting sound and the remainder capable of absorbing sound.

Still another object is the production of an amplifier ovoid in shape.

With these and other objects, not specifically mentioned, in view, the invention consists in certain constructions and combinations which will be hereinafter fully described and then specifically set forth in the claims hereunto appended.

In the accompanying drawings which form a part of this specification and in which like characters of reference indicate the same parts, Figure 1 is a longitudinal section of a device constructed in accordance with the invention, and Fig. 2 is an end view of the structure illustrated in Fig. 1.

In carrying the invention into effect there is provided an amplifier which may vary within wide limits. In the best constructions, however, an ovoidal amplifier 1; that is to say, an amplifier which is substantially

egg-shaped, is employed. This amplifier is provided with a sound deflecting surface 2, located, in the device selected to illustrate the invention, at the smaller end of the amplifier, although in certain constructions the deflecting surface may be otherwise located. The amplifier 1 is also provided with a sound-absorbing surface 3 located at the larger end thereof, although in certain constructions it may be otherwise located. In the operation of the device so far described, the sound-waves travel from the smaller toward the larger end and in directions at an angle to the axis of the amplifier, so that the entire inclosure is filled with sound. That portion of the sound-wave which strikes the surface 2 is, however, deflected from its initial course as indicated by the dotted lines in Fig. 1. That portion of the sound-waves which strike the surface 3 would, if this surface was a deflecting surface, be thrown back against the central portion of the wave and thereby form a sound jar. The surface 3 being a sound-absorbing surface no deflection takes place and the formation of sound jars is thereby prevented.

Means are provided for varying the volume of the sound issuing from the amplifier, and this means may vary within wide limits. In the best constructions, however, and as shown, the amplifier has an opening 4 in its larger end, and a closure is formed by a pair of doors 5, hinged to the wall of the amplifier although it is to be understood that any suitable closure may be employed for the purpose of closing the opening and thereby vary the sound.

Changes and variations may be made in the structure by which the invention is carried into effect. The invention, therefore, is not to be restricted to the precise details of the structure shown and described.

What is claimed is:

1. An ovoidal amplifier for a sound reproducing machine, a portion of the walls of the amplifier being capable of deflecting sound and the remainder being capable of absorbing sound, substantially as described.

2. An ovoidal amplifier for a sound reproducing machine, the smaller end of which has a sound deflecting surface and the larger end a sound absorbing surface, substantially as described.

3. In a sound reproducing machine, the combination with an ovoidal amplifier a portion of which has a sound deflecting

surface and the remainder a sound absorbing surface, of means for varying the volume of tone issuing from the amplifier, substantially as described.

5 4. In a sound reproducing machine, the combination with an ovoidal amplifier a portion of which has a sound deflecting surface and the remainder a sound absorbing surface, of a closure for varying the volume
10 of tone issuing from the amplifier, substantially as described.

5. An ovoidal amplifier for a sound reproducing machine having a sound deflecting surface and a sound absorbing surface,
15 an inlet port in the deflecting surface and an outlet port in the absorbing surface, substantially as described.

6. An ovoidal amplifier for a sound reproducing machine the smaller end of which
20 has a sound deflecting surface and an inlet port and the larger end a sound absorbing surface and an outlet port, substantially as described.

7. An amplifier for a sound reproducing
25 machine, a portion of the walls of the amplifier being capable of deflecting sound and the remainder being capable of absorbing sound whereby deflection across the axis of the amplifier is prevented, substantially as
30 described.

8. An amplifier for a sound reproducing machine having a smaller and a larger end, the smaller end of which has a sound deflecting surface and the larger end a sound
35 absorbing surface whereby deflection across the axis of the amplifier is prevented, substantially as described.

9. In a sound reproducing machine, the combination with an amplifier a portion of
40 which has a sound deflecting surface and the remainder a sound absorbing surface whereby deflection across the axis of the amplifier is prevented, of means for varying

the volume of sound issuing from the amplifier, substantially as described.

10. In a sound reproducing machine, the combination with an amplifier a portion of which has a sound deflecting surface and the remainder a sound absorbing surface whereby deflection across the axis of the
50 amplifier is prevented, of a closure for varying the volume of sound issuing from the amplifier, substantially as described.

11. An amplifier for a sound reproducing machine having a sound deflecting surface,
55 an inlet port in the deflecting surface, a sound absorbing surface whereby deflection across the axis of the amplifier is prevented, and an outlet port in the absorbing surface, substantially as described.

12. An amplifier for a sound reproducing machine the smaller end of which has a sound deflecting surface provided with an inlet port and the larger end of which has a sound absorbing surface whereby deflec-
65 tion across the axis of the amplifier is prevented and being provided with an outlet port, substantially as described.

13. An ovoidal amplifier for sound reproducing machines, a portion of its walls
70 being capable of absorbing sound whereby deflection across the axis of the amplifier is prevented, substantially as described.

14. An ovoidal amplifier for sound reproducing machines the walls of the larger
75 end of which are capable of absorbing sound whereby deflection across the axis of the amplifier is prevented, substantially as described.

In testimony whereof, I have signed my
80 name to this specification in the presence of two subscribing witnesses.

SYDNEY I. PRESCOTT.

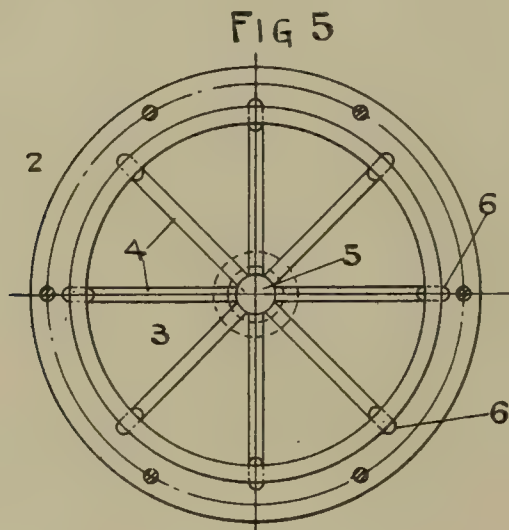
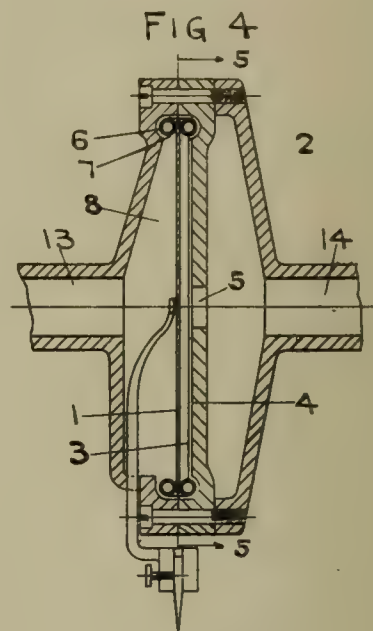
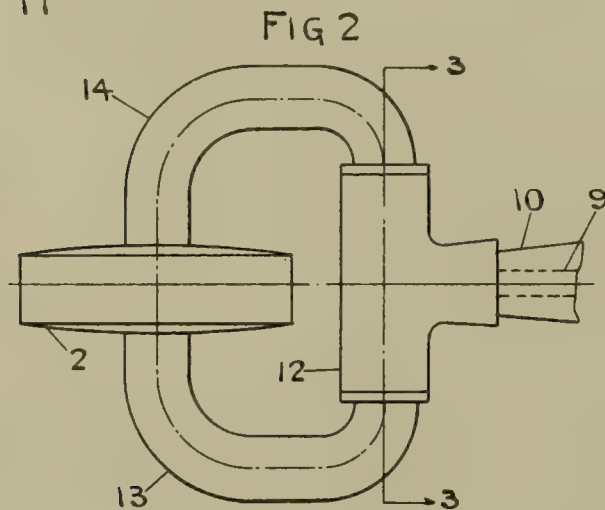
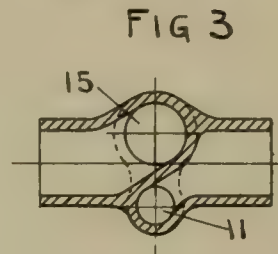
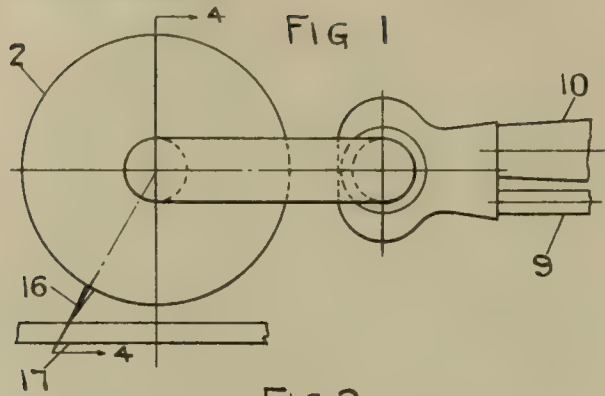
Witnesses:

FRANK B. MIDDLETON, Jr.,
ETHEL M. WHITEHEAD.

S. I. PRESCOTT.
SOUND REPRODUCING MACHINE.
APPLICATION FILED MAR. 18, 1909.

965,329.

Patented July 26, 1910.



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SOUND-REPRODUCING MACHINE.

965,329.

Specification of Letters Patent.

Patented July 26, 1910.

Application filed March 13, 1909. Serial No. 484,287.

To all whom it may concern:

Be it known that I, SYDNEY I. PRESCOTT, a citizen of the United States, residing at Camden, county of Camden, in the State of New Jersey, have invented a new and useful Sound-Reproducing Machine, of which the following is a specification.

This invention relates to improvements in sound reproducing machines.

Heretofore, there have been in use two distinct types of sound reproducing machines, both of which utilized a record of sound vibrations. In one type, the stylus operating in connection with the record vibrated a diaphragm which set up corresponding sound impulses. In the other type, the stylus operated a valve which controlled a flow of air under pressure, the sound impulses being generated in this case by the interruption of the flow of the air. In the diaphragm type of machine, the impulses were produced by compressing the air between the diaphragm and a compression surface in close proximity thereto, the impulses escaping through an outlet port in the compression surface. When the diaphragm was moved toward the compression surface, the air in the space between the two was slightly compressed and this resulted in a slight flow of air through the outlet port. When the diaphragm moved in the opposite direction; that is to say, away from the compression surface, the tendency was to create a partial vacuum between the diaphragm and the compression surface, and draw back into this space the air which had just been forced out. Thus was produced an area of rarefaction following the area of compression. In view of the fact that the diaphragm exerted a force during the rarefaction period equal to the force exerted during the compression period, what was done during the compression period was partially undone during the rarefying period. The result was the partial obliteration of the sharp line of demarcation between the successive areas of compression and rarefaction. The absence of a sharp line of demarcation between the area of compression and the area of rarefaction which together form what is commonly known as an air vibration, results in a sound which is more indistinct than it should be, and the higher the pitch and the greater the volume of the sound, the greater

is the loss. What is known as "blasting" of the tone is partially due to the action above referred to.

It is one of the objects of this invention to provide means whereby the sharp line of demarcation between the successive areas of compression and rarefaction shall not be affected by the means employed for imparting sound impulses.

A further object of the invention is to provide means for conducting a continuous flow of air to the impulse or compression surface, so that there will be no tendency of the impulse imparting means to retard the propagation of the successive areas of compression and rarefaction.

Another object of the invention is to provide means for conducting a continuous flow of air to and across the compression surface in a plurality of streams so that there will be no uneven action while sound impulses are imparted to the air covering the compression surface.

With these and other objects, not specifically mentioned, in view, the invention consists in certain constructions and combinations which will hereinafter be fully described and then specifically pointed out in the claims hereunto appended.

In the accompanying drawings which form a part of this specification, and in which like characters of reference indicate the same parts, Figure 1 is a side elevation of a device constructed in accordance with the invention; Fig. 2 is a plan view of the structure illustrated in Fig. 1; Fig. 3 is a section on the line 3—3 of Fig. 2; Fig. 4 is a section on the line 4—4 of Fig. 1; and Fig. 5 is a detailed view.

In sound reproducing machines when sound impulses are imparted to the air, it is desirable that the line of demarcation between the successive areas of compression and rarefaction be kept sharply defined, particularly when notes of high pitch or great volume are reproduced, for unless this is done there is danger of the note being blasted. In carrying the present invention into effect, therefore, means are provided for maintaining the sharp line of demarcation between the successive areas of compression and rarefaction, before diffusion in the atmosphere, and this means may vary within wide limits. While in some constructions

other means may be employed for this purpose, in the best constructions the desired result will be effected by conducting a continuous flow of air to the means for imparting sound impulses, so that there will be no tendency of the sound imparting means to partially obliterate the sharp line of demarcation above referred to, by a reflex action.

While other means for imparting sound impulses may, in some constructions, be used, in the best constructions this means will include a diaphragm and a cooperating compression surface, both of which may vary within wide limits. When a compression surface is used, a continuous flow of air will be conducted to and across it, preferably in a plurality of streams converging radially toward a common center, so that the impulse imparted to the air covering the compression surface will be conducted evenly to the common center. As shown, there is provided a diaphragm 1 mounted, in a manner well known in the art, in a sound box 2. In close proximity to the diaphragm 1 is a compression surface 3. The compression surface 3 is provided with a series of radial channels 4 crossing its face, these channels forming means for conducting a continuous flow of air to and across the surface. In the device selected to illustrate the invention, the compression surface is flat and circular, although it will be readily understood that other forms may, in some constructions, be used. The compression surface is provided with an outlet port 5 which is, or may be, centrally located, and the channels 4, before referred to, are in communication with this outlet port. When the diaphragm moves toward the compression surface, the impulse set up escapes through the outlet port 5 in the same manner as it does in many sound boxes well known in the art; that is to say, the air compressed between the diaphragm and the compression surface moves outwardly through the outlet port 5. When the diaphragm moves away from the compression surface, a larger space is formed between it and the compression surface, and this space must be filled with air. Air is conducted through the channels 4, before referred to, to take the place of the air expelled through the outlet port 5, so that there is no reflex action or partial obliteration of the sharp line of demarcation between an area of compression which has just passed through the outlet port 5 and the following area of rarefaction. In order to supply a continuous flow of air to the channels 4, there is provided a series of by-passes 6, one for each channel, around the gaskets 7 and edge of the diaphragm 1, and in communication with a chamber 8 within which the diaphragm is mounted. These by-passes provide means for conducting a continuous flow of air from the opposite side

of the diaphragm to the compression surface. It will be readily understood that since the distance from the diaphragm to the base of the channels 4 is very much greater than the distance from the diaphragm to the impulse field or compression surface, that there will be no interruption to the continuous flow of the air through the channels for there will be little or no compression of the air within the channels. The impulse set up between the diaphragm and compression surface will, however, be imparted to the air within the channels.

The continuously flowing air may be obtained from any suitable source of supply. In the device selected to illustrate the invention, the air will come from a suitable source of supply, not shown, through a pipe 9 mounted on the under side of a sound conducting tube 10 forming a part of the reproducing apparatus, and the construction of which is well known in the art. The air pipe 9 is in communication with a channel 11 formed in a T-coupling 12 on the end of the sound conducting tube 10. The channel 11 is in turn in communication with a bent tube 13 one end of which is connected with the sound box 2, its interior being in communication with the chamber 8. The outlet port 5, before referred to, is in communication with a bent tube 14, one end of which is in communication with a channel 15 formed in the T-coupling 12 and which discharges into the interior of the sound conducting arm 10. A more detailed description of this part of the device is deemed unnecessary to an understanding of the invention and is, therefore, omitted in the interest of brevity and clearness. The diaphragm 1 is connected in the usual manner with a stylus 16 which operates in conjunction with a record disk 17. A detailed description of the connections between the diaphragm 1 and the stylus 16, and of the record 17 and its operating mechanism, not being necessary to an understanding of the present invention, is omitted in the interest of brevity and clearness.

In view of the foregoing, a detailed description of the operation of the device is considered unnecessary.

Changes and variations may be made in the structure by which the invention is carried into effect. The invention, therefore, is not to be restricted to the precise details of the structure shown and described.

What is claimed is:

1. In a sound reproducing machine, the combination with a compression surface, of means for conducting a continuous flow of air to and across said surface in a plurality of streams, substantially as described.

2. In a sound reproducing machine, the combination with a compression surface, of means for conducting a continuous flow of

air to and across said surface in a plurality of converging streams substantially as described.

3. In a sound reproducing machine, the combination with a circular compression surface, of means for conducting a continuous flow of air to and radially across said surface in a plurality of streams, substantially as described.

4. In a sound reproducing machine, the combination with a circular compression surface having a plurality of radial channels, of means for conducting a continuous flow of air to and through said channels, substantially as described.

5. In a sound reproducing machine, the combination with a compression surface, of means for conducting a continuous flow of air to and across said surface in a plurality of streams, and means for imparting sound impulses to the air covering the compression surface, substantially as described.

6. In a sound reproducing machine, the combination with a compression surface, of means for conducting a continuous flow of air to and across said surface in a plurality of converging streams, and means for imparting sound impulses to the air covering the compression surface, substantially as described.

7. In a sound reproducing machine, the combination with a circular compression surface, of means for conducting a continuous flow of air to and radially across said surface in a plurality of streams, and means for imparting sound impulses to the air covering the compression surface, substantially as described.

8. In a sound reproducing machine, the combination with a circular compression surface having a plurality of radial channels, of means for conducting a continuous flow of air to and through said channels, and means for imparting sound impulses to the air covering the compression surface, substantially as described.

9. In a sound reproducing machine, the combination with a compression surface, of means for conducting a continuous flow of air to and across said surface in a plurality of streams, and a diaphragm for imparting sound impulses to the air covering the compression surface, substantially as described.

10. In a sound reproducing machine, the combination with a compression surface, of means for conducting a continuous flow of air to and across said surface in a plurality of converging streams, and a diaphragm for imparting sound impulses to the air covering the compression surface, substantially as described.

11. In a sound reproducing machine, the combination with a circular compression surface, of means for conducting a continuous flow of air to and radially across said

surface in plurality of streams, and a diaphragm for imparting sound impulses to the air covering the compression surface, substantially as described.

12. In a sound reproducing machine, the combination with a circular compression surface having a plurality of radial channels, of means for conducting a continuous flow of air to and through said channels, and a diaphragm for imparting sound impulses to the air covering the compression surface, substantially as described.

13. In a sound reproducing machine, the combination with a chamber, of a diaphragm within the chamber, a compression surface on one side of the diaphragm, and means for conducting a continuous flow of air from the opposite side of the diaphragm to the compression surface, substantially as described.

14. In a sound reproducing machine, the combination with a chamber, of a diaphragm within the chamber, a compression surface on one side of the diaphragm, and means for conducting a continuous flow of air in a plurality of streams from the opposite side of the diaphragm to the compression surface, substantially as described.

15. In a sound reproducing machine, the combination with a compression surface, of means for conducting a continuous flow of air to the surface, a diaphragm for imparting sound impulses to the air covering the compression surface, the compression surface being provided with an outlet port for the sound, substantially as described.

16. In a sound reproducing machine, the combination with a compression surface, of means for conducting a continuous flow of air to the surface, a diaphragm for imparting sound impulses to the air covering the compression surface, the compression surface being provided with a centrally located outlet port for the sound, substantially as described.

17. In a sound reproducing machine, the combination with a compression surface having an outlet port for the sound, of means for conducting a continuous flow of air to and across the compression surface to the port, and means for imparting sound impulses to the air covering the compression surface, substantially as described.

18. In a sound reproducing machine, the combination with a compression surface having a centrally located outlet port for the sound, of means for conducting a continuous flow of air to and across the compression surface to the port, and means for imparting sound impulses to the air covering the compression surface, substantially as described.

19. In a sound reproducing machine, the combination with a compression surface having an outlet port for the sound, of

means for conducting a continuous flow of air to and across the compression surface to the port, and a diaphragm imparting sound impulses to the air covering the compression surface, substantially as described.

20. In a sound reproducing machine, the combination with a compression surface having a centrally located outlet port for the sound, of means for conducting a continuous flow of air to and across the compression surface to the port, and a diaphragm imparting sound impulses to the air covering the compression surface, substantially as described.

21. In a sound reproducing machine, the combination with a chamber, of a diaphragm within the chamber, a compression surface on one side of the diaphragm, and a by-pass for conducting a continuous flow of air from the opposite side of the diaphragm to the compression surface, substantially as described.

22. In a sound reproducing machine, the combination with a chamber, of a diaphragm

within the chamber, a compression surface on one side of the diaphragm, and a plurality of by-passes for conducting a continuous flow of air in a plurality of streams from the opposite side of the diaphragm to the compression surface, substantially as described.

23. In a sound reproducing machine, the combination with a chamber, of a diaphragm within the chamber, a compression surface on one side of the diaphragm and having a plurality of radial channels, and a plurality of by-passes for conducting a continuous flow of air in a plurality of streams from the opposite side of the diaphragm to the channels in the compression surface, substantially as described.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

SYDNEY I. PRESCOTT.

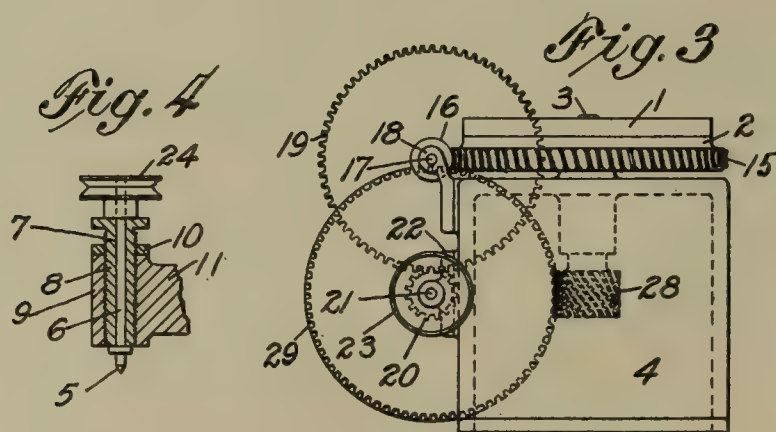
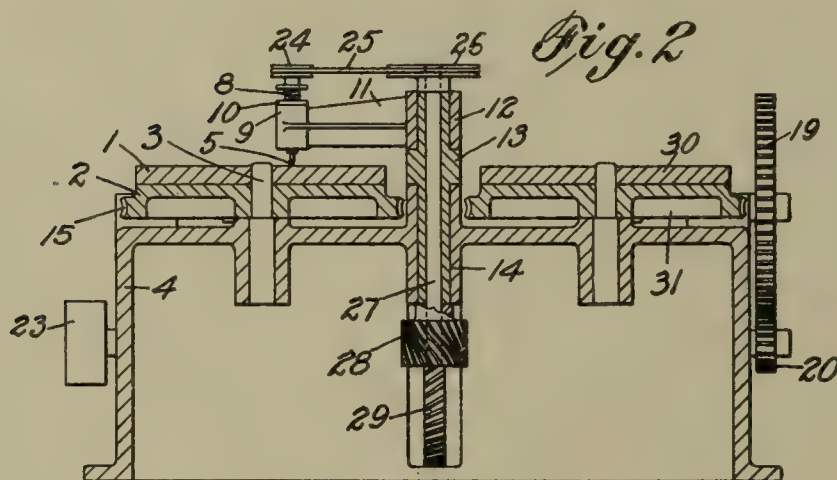
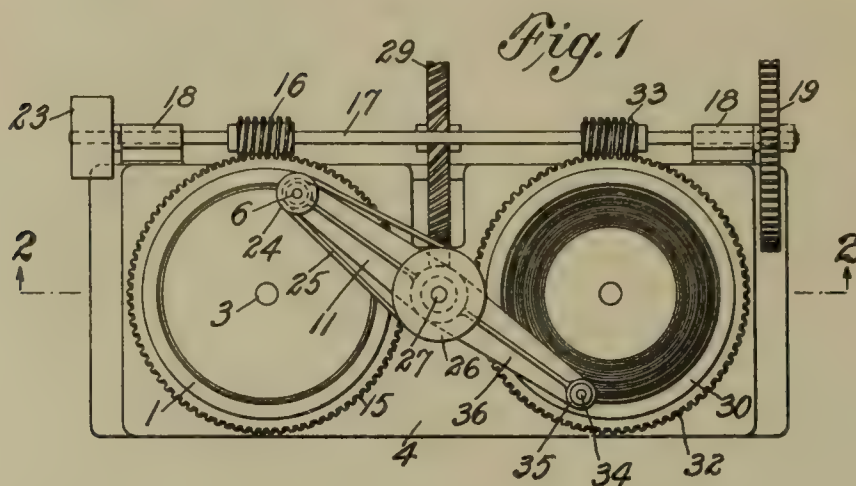
Witnesses:

FRANK B. MIDDLETON, Jr.,
ETHEL M. WHITEHEAD.

S. I. PRESCOTT.
SOUND RECORD DUPLICATING APPARATUS.
APPLICATION FILED APR. 10, 1909.

965,330.

Patented July 26, 1910.



Attest.
Frank H. Vick Jr.
N. F. Jacobs

Inventor
Sydney Prescott

UNITED STATES PATENT OFFICE.

SYDNEY I. PRESCOTT, OF CAMDEN, NEW JERSEY.

SOUND-RECORD-DUPLICATING APPARATUS.

965,330.

Specification of Letters Patent.

Patented July 26, 1910.

Application filed April 10, 1909. Serial No. 489,036.

To all whom it may concern:

Be it known that I, SYDNEY I. PRESCOTT, a citizen of the United States, residing at Camden, county of Camden, in the State of New Jersey, have invented a new and useful Improvement in Sound-Record-Duplicating Apparatus, of which the following is a specification.

This invention relates to an improvement in sound record duplicating apparatus, particularly to that type of sound records known as "disk" records.

In making sound records of this type, what is known as a master record is first made in a waxy substance. This is done by a stylus operated by a diaphragm set in motion by sound waves traveling through the air from a source of sound to the recording apparatus. In this operation the record groove is necessarily scratched, cut or engraved to its full depth. Although the depth and width of the groove is very limited, yet the power of the sound waves acting upon the diaphragm that operates the stylus is also very limited, and very little resistance set up by the material of which the master record is composed results in an uneven or rough groove. Such resistance exists in every known material adapted for use in a master record. The stylus, in plowing through the material, chatters more or less, even when the vibrations are faithfully traced or marked in the face of the master record; that is to say, the speed of the feeding movement of the master record to the tool is so great that the tool is more or less overloaded, and this results in the chattering above referred to. Heretofore, the record groove of a master record has never been perfectly smooth for the above reason. The roughness in the walls of the groove produced by the chattering of the tool results, when the sound is reproduced, in a sort of a scratching noise entirely foreign to the sound to be reproduced. This is objectionable.

It is one of the objects of this invention to provide an apparatus capable of forming a record groove that shall be not only a faithful representation of sound vibrations, but shall have perfectly smooth walls.

Heretofore, after a master record has been made by the usual method, it has been customary to make a negative of the same by an electro-typing process, and from this negative pressing commercial records. Since the groove of the master record is not per-

fectly smooth, it follows that the grooves of the commercial records made therefrom will not be perfectly smooth, even when there are no imperfections produced by the electro-typing and pressing processes.

It is another object of this invention to provide means for making a master record, the groove of which has perfectly smooth walls, so that, by the electro-typing and pressing processes now in use, commercial records can be manufactured in a higher degree of perfection than has been heretofore possible.

In recording, it is necessary that the material be fed to the recording tool at a comparatively high speed, that most commonly used being about seventy feet per minute. Heretofore, the structure commonly used under these conditions included a tool which cut, or plowed out material from the face of the record blank to form a groove of full depth and width. A rotating cutter could not be used because of the high speed of the feeding movement. Where a groove or channel is to be cut in certain material to its full depth and width in one operation, a cutter rotating at high speed will produce a smooth groove free from chattered walls, when the feeding movement is relatively slow.

It is a further object of this invention, therefore, to provide a device in which a rotating cutter or milling cutter may be used to produce a groove the walls of which are free from roughness or chatter, the feeding movement being relatively slow.

Still another object is to provide a device that can be used in connection with a master record, or even with a commercial record produced by the process heretofore used, and that will duplicate the groove in such record, the duplicated groove being free, however, from the chattered walls.

With these and other objects, not specifically mentioned, in view, the invention consists in certain constructions and combinations which will be hereinafter fully described and then specifically pointed out in the claims hereunto appended.

In the accompanying drawings which form a part of this specification and in which like characters of reference indicate the same parts, Figure 1 is a plan view of a machine constructed in accordance with the invention. Fig. 2 is a sectional elevation of the structure illustrated in Fig. 1, the section

being taken on the line 2—2 of Fig. 1. Fig. 3 is an end elevation of the structure shown in Fig. 1, certain parts being omitted. Fig. 4 is a detailed view of the milling cutter 5 illustrated in the structure shown in Fig. 1.

In carrying the invention into effect there is provided a sound record blank upon the surface of which a record groove is to be formed, and this blank may vary within wide limits. It may be of wax or a wax-like substance, or it may be of metal or other substance suitable for the purpose. In the best constructions, a metal sound record blank will be used, because after the groove is cut in its face a permanent practically indestructible master record is obtained, while it is well known that the life of the wax master records heretofore used is relatively limited. Furthermore, the metallic record of the present invention is less liable to injury in handling than the wax records heretofore used. Such a record blank of the disk type is shown in the drawings and is marked 1, although it is to be understood that blanks of other forms, as for instance cylindrical blanks, may be used in certain constructions.

There is provided a support for the sound record blank, and this support may vary within wide limits. Where a cylindrical blank is used the support will, of course, be different from that used when records of the disk type are made. In the best constructions, however, and as shown, a support 2 is shown, this support being in the form of a turntable rotatably mounted upon a post 3 secured in the frame 4 of the structure.

For the purpose of cutting a groove in the record blank having perfectly smooth walls, there is provided a milling cutter, and this cutter may vary within wide limits. In the best constructions, however, a milling cutter 5 rotating at high speed will be employed. This cutter has a point corresponding in shape to the shape of the groove to be produced and is provided with a shank 6 journaled in a bearing 7 formed in a stem 8 threaded into a boss 9, so that it may be adjusted toward or away from the face of the record. In the device selected to illustrate the invention, there is provided a lock-nut 10 threaded on the stem 8 and contacting with the upper face of the boss 9 before referred to. By means of this structure the depth of the groove may be regulated and the cutter held in adjusted position. While the structure just described provides for an adjustable milling cutter, it is to be understood that other means for adjusting the cutter may be used, and indeed in certain constructions the milling cutter may be mounted in a fixed position and the record blank may be adjusted to the milling cutter, and in certain other constructions both may be adjusted.

While in certain constructions the milling cutter may operate in a fixed position and the record blank be moved with respect thereto; in the best constructions, and as shown, the milling cutter is a traveling and swinging cutter operating in conjunction with a blank mounted in a fixed position. To this end the boss 9 is mounted upon an arm 11 extended from a boss 12 loosely mounted upon a standard 13 fixed at 14 in the frame 4 before referred to.

Means are provided for producing a relative movement of the blank and cutter to cause the cutter to produce a record groove in the blank in accordance with sound vibrations, and this means may vary within wide limits. This may be done by moving either the milling cutter or blank, or both. In certain constructions where it is desired to rotate the blank, the operating connections from a suitable source of motion may cooperate directly with the blank. In certain other constructions, the operating connections may cooperate directly with the support for the blank. In either case the means for rotating the blank may vary within wide limits. The cutter is caused to rotate at high speed by mechanism hereinafter to be described and the blank and support are caused to slowly rotate to produce a slow feeding movement that will give time for the milling cutter to produce a groove having perfectly smooth walls. While other means may, in certain constructions, be used for the purpose of producing the slow movement of the support and record blank, preferably gearing is employed for this purpose. In the best constructions, and as shown, a worm wheel is formed on the support 2 and is indicated conventionally at 15. This worm wheel is in mesh with a worm 16 also indicated conventionally. This worm 16 is mounted upon a shaft 17 mounted in bearings 18 carried by the frame 4 above referred to. Upon one end of this shaft is mounted a spur gear 19, indicated conventionally, which is in mesh with a spur pinion 20 mounted upon the end of a shaft 21, below the shaft 17 above referred to, the shaft 21 being mounted in bearings 22 carried by the frame 4 above referred to. Upon the opposite end of the shaft 21 is a pulley 23 which may derive its motion from any suitable source, such for instance as a line shaft.

The milling cutter may derive its motion from any suitable source. It is preferable, however, that the high speed motion of the milling cutter and the relatively slow motion of the record blank be both derived from a common source of motion. In the best constructions, and as shown, the shank 6 of the milling cutter 5 extends through and beyond the stem 8 and upon its projecting end is mounted a pulley 24. Over this pulley 24 runs a belt 25 which also runs

over another pulley 26 mounted on a shaft 27 journaled in the standard 13 before referred to. Upon the lower end of this shaft 27 is a spiral pinion 28, indicated conventionally in the drawings. This spiral pinion 28 is in mesh with a spiral gear 29 mounted on the shaft 21 before referred to and which is the high speed power shaft of the machine.

The structure so far described provides means for operating the milling cutter at high speed and for producing a slow rotary movement of the blank which constitutes the feeding movement of the material to the tool or cutter.

Means are provided for controlling the path of the record groove in the blank and this means may vary within wide limits. While other suitable means may in certain constructions be employed for this purpose, preferably a guide is employed, and when a guide is employed it may vary within wide limits. In the best constructions, however, and as shown, a rotating guide is employed, this guide being the groove of a master record previously made by the usual process and electro-plated, or a copy of the same, or in fact an ordinary commercial record. Such a record or guide is indicated at 30, the guide being mounted upon a turntable 31 provided with a worm wheel 32 in mesh with a worm 33 mounted on the shaft 17 before referred to. Since the worm wheels 15 and 32 and the worms 16 and 33 are respectively of the same size and pitch it follows that the support and record blank and the guide will be driven at equal speeds.

There is provided a stylus or follower 34 mounted in a boss 35 carried on the end of an arm 36 extended from the boss 12 before referred to, this follower tracking in the groove of the guide 30 above referred to. The engagement of the follower with the groove of the guide controls the position and traveling movement of the milling cutter 5 through the medium of the lever formed by the arms 11 and 36 and boss 12 before referred to. It will be understood that this lever constitutes means supporting the milling cutter and the follower. The feeding movement of the blank to the milling cutter is so slow that any roughness or chatter existing in the wall of the groove of the guide will not be reproduced in the groove formed in the record blank but will be milled out. It may be here remarked in the interest of clearness, that this chatter forms no part of the undulations representing sound vibrations, but is entirely foreign thereto and constitutes an imperfection, the removal of which is desirable. Such removal is accomplished by the present invention.

From the foregoing, it will be understood that any lateral undulations representing sound waves that are in the guide 30 will

cause the lever formed of the arms 11 and 36 and boss 12 to oscillate slightly and that similar undulations will be produced in the groove formed in the record blank. It will be further understood, that since the rotation of the guide and blank is so slow and since the cutter operates at high speed that the cutter has sufficient time to remove material from the surface of the record in the path of the record groove, leaving the walls of the groove free from chatter and perfectly smooth. It will be further understood that the structure selected to illustrate the invention and other structures within the scope of the invention are capable of producing a record groove having smooth walls in a metallic blank, forming a practically indestructible master record. It will be further understood that a master record produced by the present invention may be used in the same way as the present wax master records, and that duplicates may be made therefrom by the well known electro-typing and pressing processes.

A detailed description of the operation of the device is deemed unnecessary and is, therefore, omitted in the interest of brevity and clearness.

Changes and variations may be made in the structure by means of which this invention is carried into effect. The invention is not, therefore, to be restricted to the precise details of the structure shown and described.

What is claimed is:—

1. The combination with a sound record blank, of a traveling milling cutter, and means for producing a relative movement of the blank and cutter to cause the cutter to produce a record groove in the blank in accordance with sound vibrations, substantially as described.

2. The combination with a sound record blank, of a traveling milling cutter, and means for rotating the blank to cause the cutter to produce a record groove in the blank in accordance with sound vibrations, substantially as described.

3. The combination with a sound record blank, of a swinging milling cutter, and means for producing a relative movement of the blank and cutter to cause the cutter to produce a record groove in the blank in accordance with sound vibrations, substantially as described.

4. The combination with a sound record blank, of a swinging milling cutter, and means for rotating the blank to cause the cutter to produce a record groove in the blank in accordance with sound vibrations, substantially as described.

5. The combination with a sound record blank, of a milling cutter, a support for rotating the blank to cause the cutter to produce a record groove in the blank in

accordance with sound vibrations, a rotating guide for controlling the path of the record groove, and gearing driving the support and rotating guide, substantially as described.

6. The combination with a sound record blank, of a milling cutter, a support for rotating the blank to cause the cutter to produce a record groove in the blank in accordance with sound vibrations, a rotating guide for controlling the path of the record groove, and gearing driving the support and rotating guide at equal speeds, substantially as described.

7. The combination with a sound record blank, of a milling cutter, a support for rotating the blank to cause the cutter to produce a record groove in the blank in accordance with sound vibrations, a rotating guide for controlling the path of the record groove, and gearing driving the support and guide at equal speeds and the milling cutter at a relatively high speed, substantially as described.

8. The combination with a sound record blank, of a support for the same, a post carrying the support, a milling cutter, a rotating guide, a post carrying the guide, a frame supporting the posts, and gearing driving the support and rotating guide, substantially as described.

9. The combination with a sound record blank, of a support for the same, a post carrying the support, a milling cutter, a rotating guide, a post carrying the guide, a frame supporting the posts, and gearing driving the support and rotating guide at equal speeds, substantially as described.

10. The combination with a sound record blank, of a support for the same, a post carrying the support, a milling cutter, a rotating guide, a post carrying the guide, a frame supporting the posts, and gearing

driving the support and guide at equal speeds and the cutter at a relatively high speed, substantially as described.

11. The combination with a sound record blank, of a support for the same, a milling cutter, a rotating guide, and worm gearing driving the support and rotating guide, substantially as described.

12. The combination with a sound record blank, of a support for the same, a milling cutter, a worm and worm wheel for rotating the support, a rotating guide, a worm and worm wheel driving the rotating guide, and a shaft carrying the two worms, substantially as described.

13. The combination with a sound record blank, of a support for the same, a post carrying the support, a milling cutter, a rotating guide, a post carrying the guide, a frame supporting the posts, a follower engaging the guide, means supporting the milling cutter and the follower, and gearing driving the support and guide at equal speeds and the cutter at a relatively high speed, substantially as described.

14. The combination with a sound record blank, of a support for the same, a post carrying the support, a milling cutter, a rotating guide, a post carrying the guide, a frame supporting the posts, a follower engaging the guide, a lever supporting the milling cutter and the follower, and gearing driving the support and guide at equal speeds and the cutter at a relatively high speed, substantially as described.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

SYDNEY I. PRESCOTT.

Witnesses:

ETHEL M. WHITEHEAD,
FRANK B. MIDDLETON, Jr.

965,678.

S. M. WIRTS.
SOUND REPRODUCING MACHINE.
APPLICATION FILED DEC. 2, 1909.

Patented July 26, 1910.

3 SHEETS—SHEET 1.

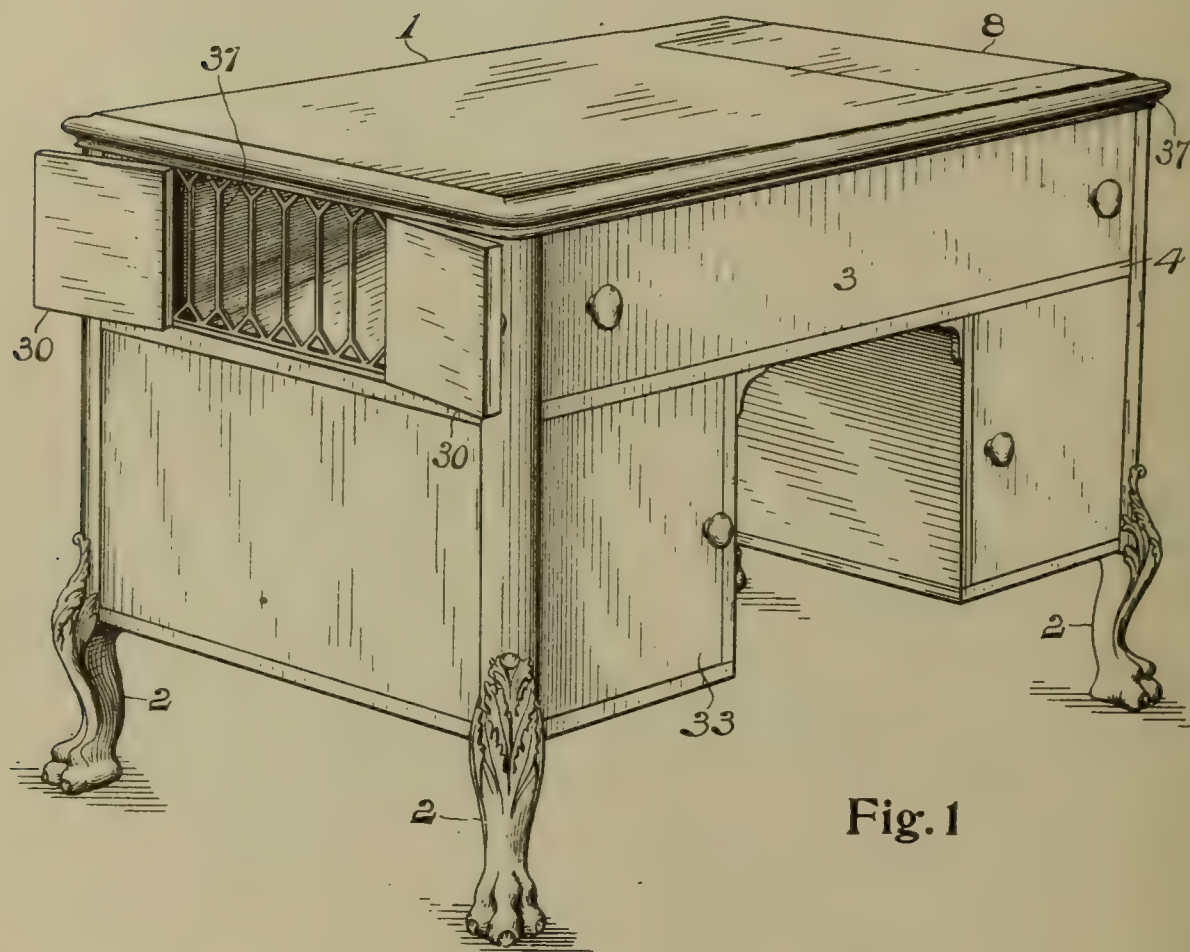


Fig. 1

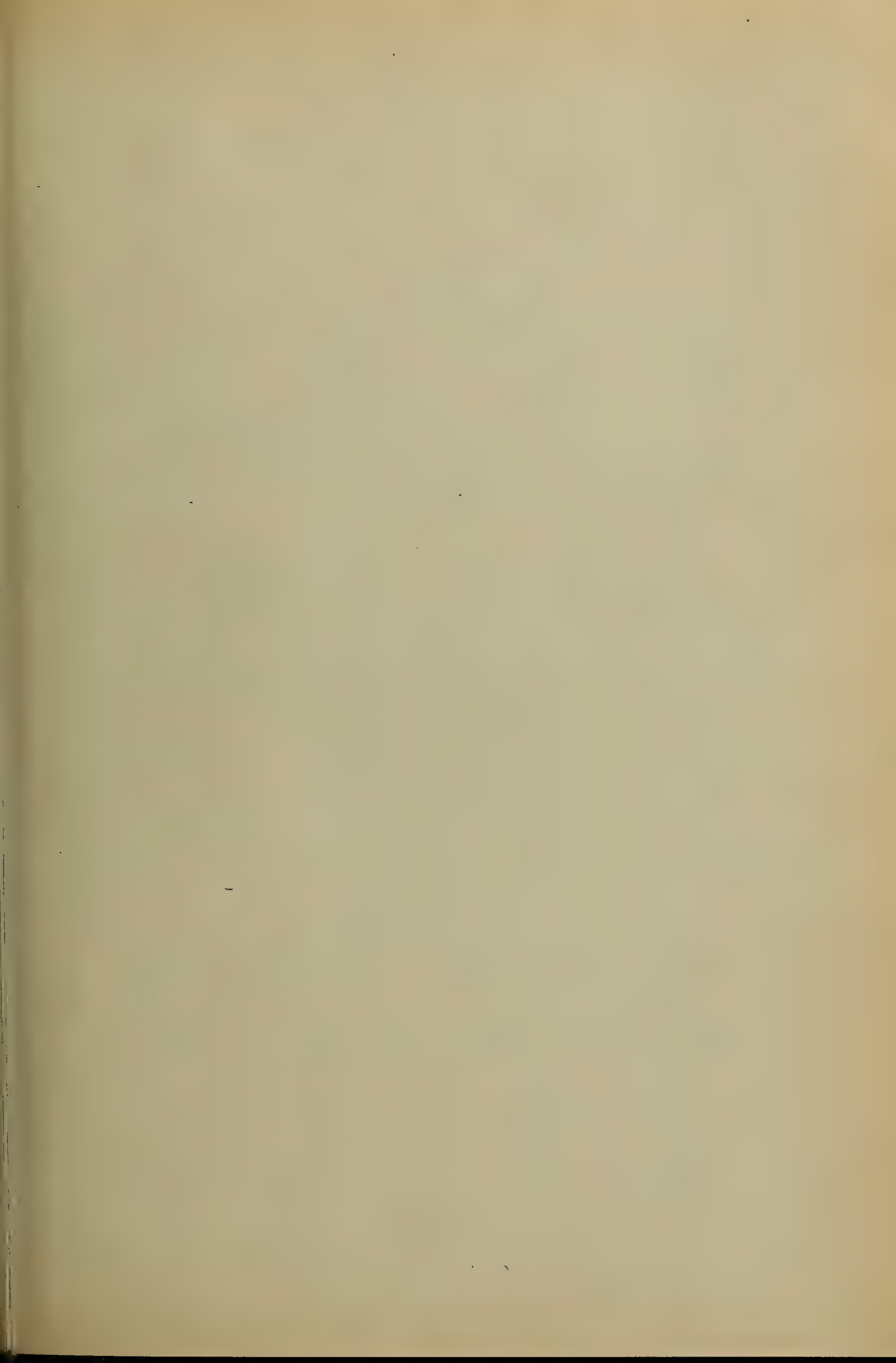
Witnesses
A. M. Shannon.
A. M. Dow.

Inventor
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By

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965,678.

S. M. WIRTS.
SOUND REPRODUCING MACHINE,
APPLICATION FILED DEC. 2, 1909

Patented July 26, 1910.

3 SHEETS—SHEET 2.

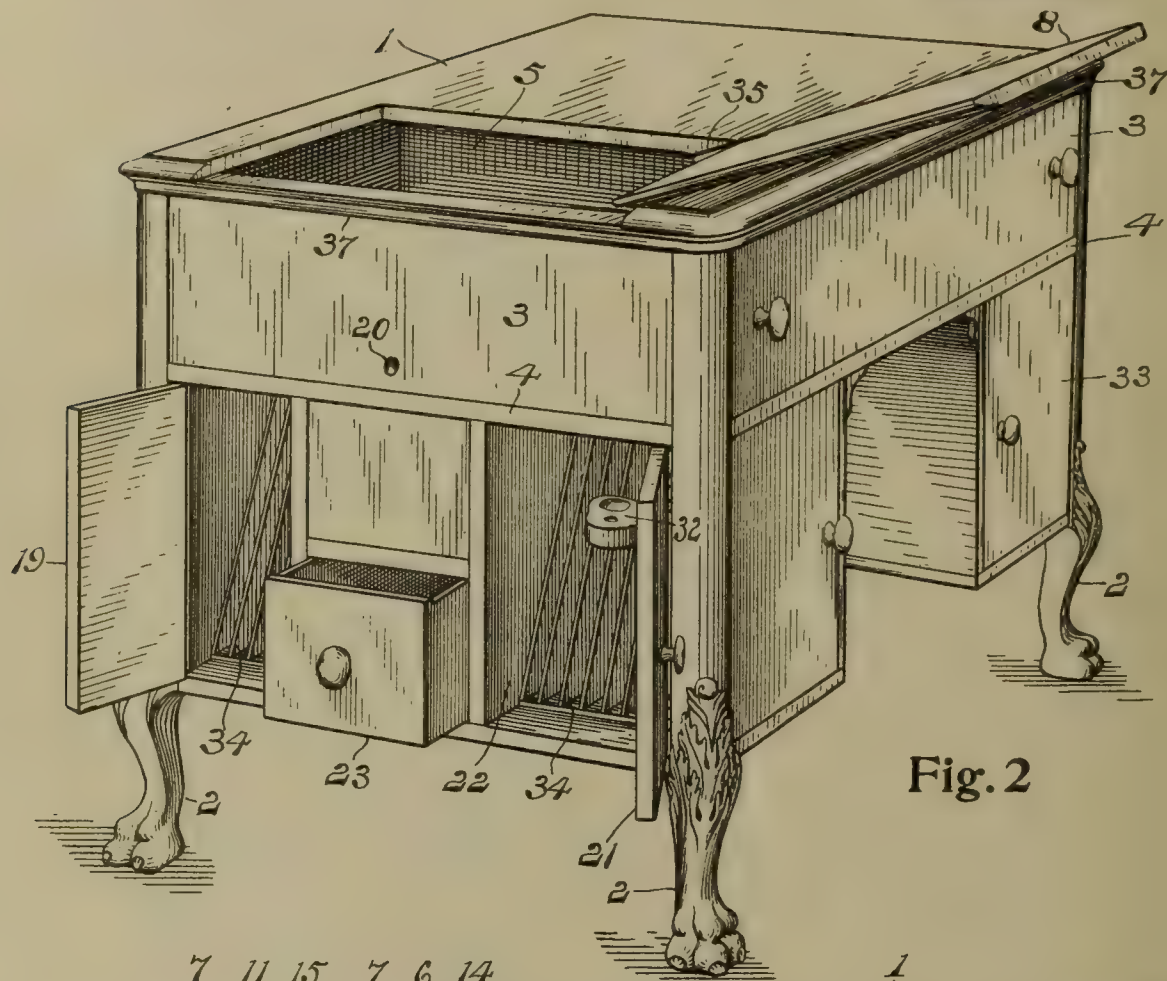


Fig. 2

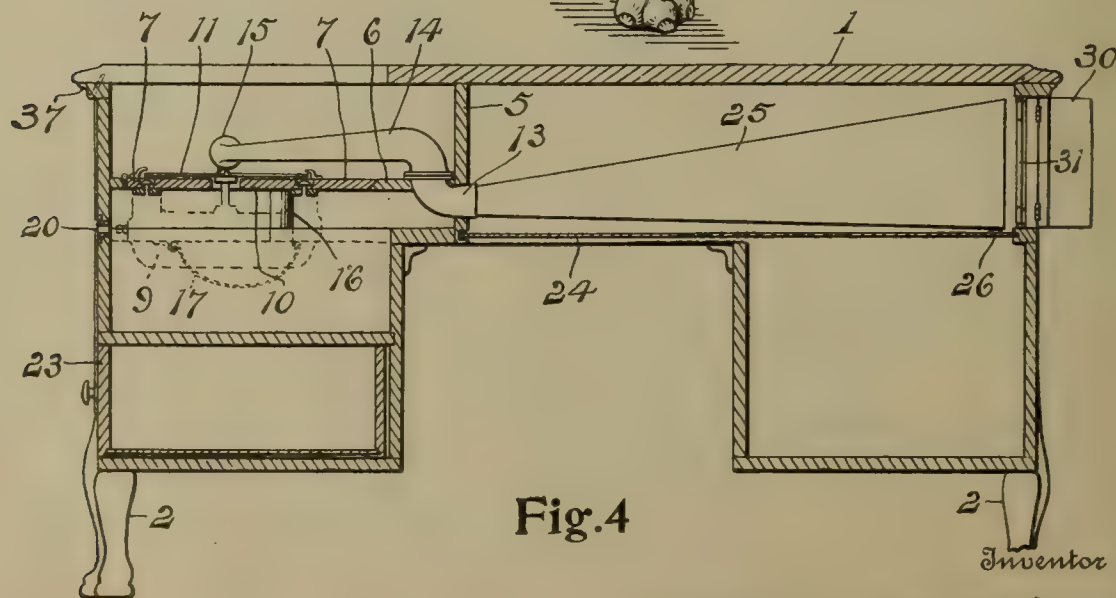


Fig. 4

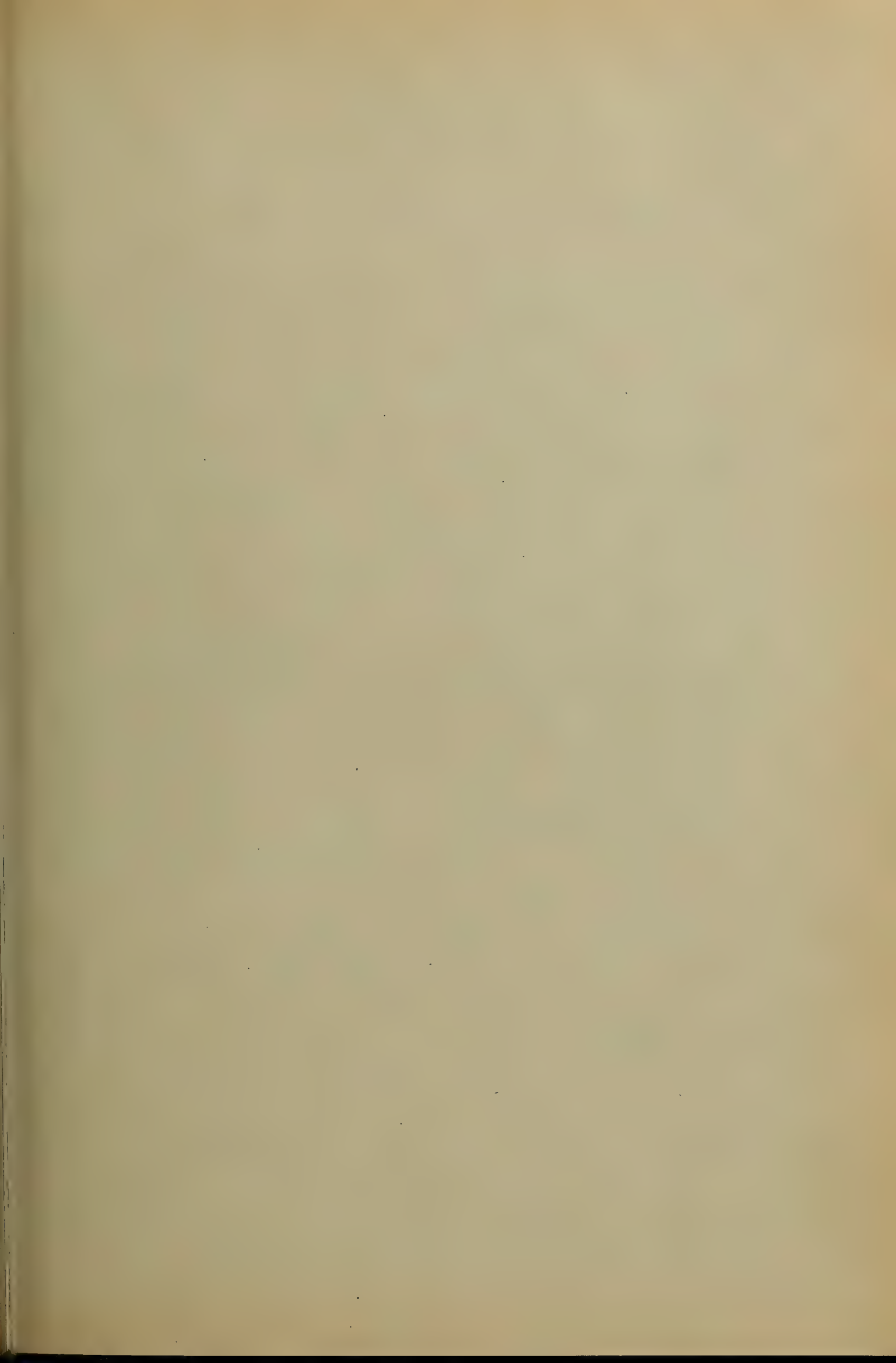
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S. M. WIRTS.
SOUND REPRODUCING MACHINE.
APPLICATION FILED DEC. 2, 1909.

965,678.

Patented July 26, 1910.

3 SHEETS—SHEET 3.

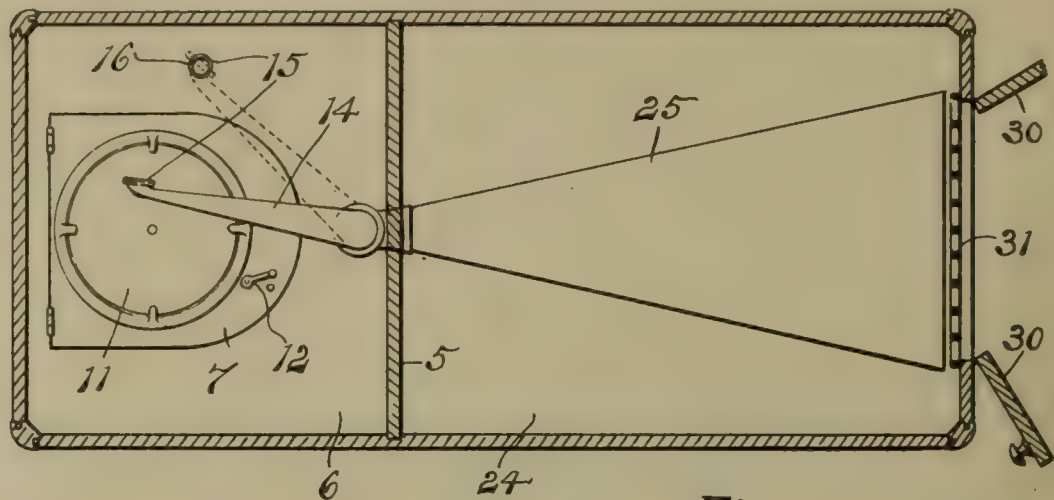


Fig. 3.

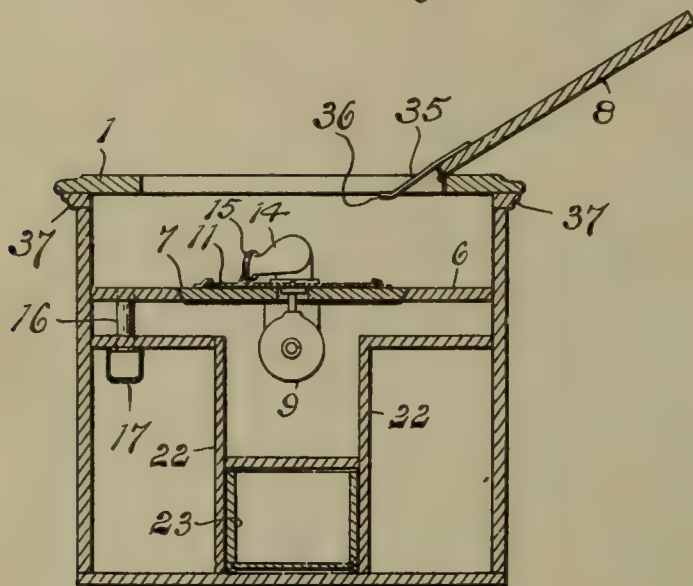


Fig. 5.

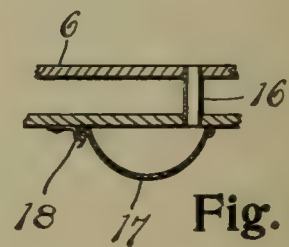


Fig. 6.

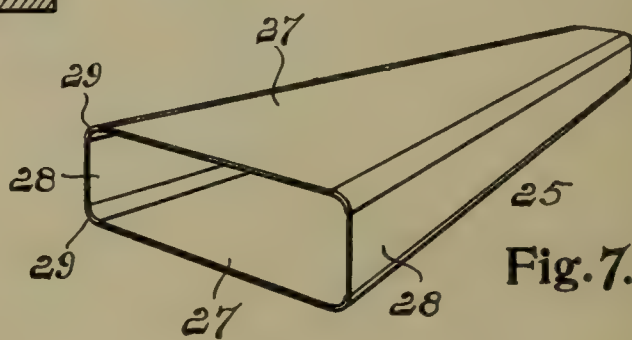


Fig. 7.

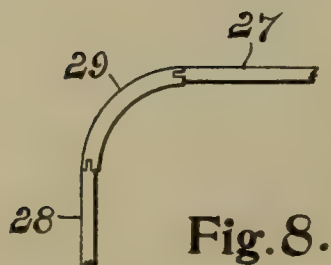


Fig. 8.

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A. M. Dow.

Inventor
Stephen M. Wirt's

By *[Signature]*
Attorneys

UNITED STATES PATENT OFFICE.

STEPHEN M. WIRTS, OF DETROIT, MICHIGAN.

SOUND-REPRODUCING MACHINE.

965,678.

Specification of Letters Patent.

Patented July 26, 1910.

Application filed December 2, 1909. Serial No. 530,899.

To all whom it may concern:

Be it known that I, STEPHEN M. WIRTS, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Sound-Reproducing Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

10 In the construction of phonographs and like sound reproducing machines, it is desirable to eliminate as far as possible all noises arising from the movements of the motor and to amplify sound waves from the diaphragm without destroying their quality.

15 This invention relates to a sound reproducing machine of the phonograph type in which provision is made for eliminating as far as possible, all sound except those produced by the diaphragm vibrations.

20 A further object of the invention is to provide an attractive exterior for the machine which makes it available as an ordinary article of furniture as well as a storage place for records and for the implements necessary in manipulating the phonograph proper.

25 The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

30 In the drawings, Figure 1 is a view in perspective of a machine embodying features of the invention showing open doors at the mouth of the horn; Fig. 2 is a similar view taken from the opposite end with doors open; Fig. 3 is a plan view of the machine with the top entirely removed; Fig. 4 is a view in central, longitudinal section showing the arrangement of a phonograph horn and sound board; Fig. 5 is a view in cross section through the table; Fig. 6 is a view in detail of a needle tray; Fig. 7 is a view in detail of a horn; and Fig. 8 is an enlarged sectional detail of a horn.

35 As shown in preferred form, an exterior casing is provided that has the general design and appearance of a library table with a removable top 1, corner legs 2 and depending sides or aprons 3 paneled to represent drawer and cabinet spaces. Horizontal rails 4 below and parallel to the top, connect the corner posts or legs and are reinforced by a cross partition 5 that transversely divides the space below the top into unequal compartments. A horizontal platform 6 forms the bottom of the smaller of these compart-

ments. It is rigidly secured to the cross wall and side frame, and together with the cross wall and adjacent sides, is constructed of wood that is not resonant and that is arranged to deaden any vibrations imparted to it.

40 A central portion 7 of the platform 6 is hinged along its outer edge so that it can be tilted up, a cover 8 in the table top being arranged to fold back on invisible hinges to permit this. The movable portion 7 forms a phonograph shelf or base. A motor 9 of any preferred type suitable for the purpose is rigidly secured in a lower compartment against the bottom of this shelf, a sound deadening sheet 10 of felt or like material being interposed between it and the motor. Preferably the base is arranged to be flush with the platform 6 when closed down and the meeting margins of the base and platform are felt-lined or otherwise provided with sound deadening means.

45 A main spindle of the motor extends through the shelf and a turntable 11 of standard construction is mounted thereon to rotate a short distance above and parallel to the shelf. A speed regulating lever 12 for the motor is mounted on the upper side of the shelf.

50 A tubular elbow or fitting 13 is secured in an aperture in the platform 6 adjacent the cross partition 5 with its mouth substantially flush with the platform. A sound tube 14 is swiveled in the mouth of this fitting to swing horizontally over the turntable in the usual way, and has at the inner end a diaphragm and needle holder 15 of conventional type. A tube or well 16 is secured in the platform 6 so that the needle holder may be swung into register with it. The well discharges into a segmental tray 17 secured closely against the under side of the platform as by a suitable hinge at one end and a snap 18 at the other. Discarded needles are dropped into this by swinging the sound tube over the well and releasing the needle. The tray 17 is accessible through a door 19 that closes a compartment directly below it, and may be emptied by releasing the snap 18 and allowing it to swing down, the needles sliding readily out of the smoothly rounded receptacle. If the motor is spring actuated a winding crank may be inserted through an aperture in a panel that closes a space directly below the motor. This space is cut off from the com-

partment closed by the door 19 and a companion compartment closed by a door 21 on the opposite side, by vertical partitions indicated at 22 and a tool-drawer 23 fills the space below the motor compartment.

A sounding board 24 of resonant wood or like suitable material, forms the bottom of the larger compartment adjacent the cross wall 5, its side and outer margins being framed into the side casing and its inner margin adjacent the cross wall 5 being preferably independent thereof. A horn 25 has its small end or neck inserted into the lower end of the fitting 13 which extends through an aperture in the partition 5.

The mouth of the horn rests on suitable blocks 26 of soft rubber or like material on the sounding board adjacent the end wall of the table. Tapering top and bottom walls 27 of thin, selected, resonant woods such as are used in stringed instruments, are connected to side walls 28 of like material by round corner strips 29 of heavier wood, the edges being dove-tailed together. It is found that the best effect is produced by finishing the outer faces of the corners and sides to form a flush unbroken surface while the inner faces of the corner places are allowed to project slightly.

An opening in the end of the table that registers with the mouth of the horn is closed by doors 30 which are hinged so that they may be swung outwardly to form extensions of the side walls of the horn. A grille 31 of ornamental design is removably secured in the opening.

The door 21 carries a needle and tool box 32. Doors 33 close cabinets or compartments on the horn end of the table that correspond to the compartments at the other end and suitable ledges 34 or racks are placed in these compartments for supporting record disks. The cover 8 which closes the opening in the table top is hinged to swing laterally so that articles on the rest of the table need not be moved when it is desired to use the phonograph. To prevent marring of the top, the cover 8 has a finger 35 secured to its underside near the hinge with an inturned end 36 that underlies the top and holds the cover in elevated position so as not to rest on the table. As a further detail of construction a rectangular frame 37 on the top of the casing has concealed screws (not indicated) or like fastenings engaging the top which, when loosened, permit the bodily removal of the latter.

The operating mechanism of the phonograph is thus supported independently of the horn and of the sound tube in such manner that vibrations therefrom are absorbed and deadened. The sound tube is likewise rigidly supported by non-resonant members independently of the motor so that the vibrations of the latter which occasion the

scratching noises heard when the horn is directly connected to the motor are taken up. The horn itself is constructed of resonant materials adapted to amplify the sound waves of the diaphragm without destroying or changing their quality and its effect is enhanced by the resonant compartment in which it is placed, the sounding board vibrating in unison with the horn walls and communicating these sound waves to the air in the compartment so that they materially increase the volume of sound from the opening in the wall adjacent the horn mouth. The sounding board is like-wise cut off from the vibrations of the motor by the method of supporting it in the table.

The machine when not in use is an ornamental and useful article of furniture and at the same time has a capacity for a large number of records.

Obviously, changes in details of construction may be made without departing from the spirit of the invention and I do not care to limit myself to any particular form or arrangement of parts.

What I claim as my invention is:—

1. A sound reproducing machine comprising a casing having a sound-muffling compartment and a resonant compartment separated therefrom by a sound-deadening wall and provided with a sounding board that constitutes another wall thereof, sound reproducing means in the muffling compartment, a conductor for leading sounds from the reproducer into the resonant compartment, and an amplifying horn resting on the sounding board in the resonant compartment for directing sounds from the conductor toward an opening in the outer wall of said compartment, the horn having plane vibratable walls of resonant material.

2. A sound reproducing machine comprising a casing having a sound-muffling compartment, a compartment below the sound-muffling compartment, a motor base hinged in the base of the upper compartment, a motor secured to the underside thereof, a sound-reproducing apparatus in the upper compartment operated by the motor, a resonant compartment separated from the muffling compartment by a sound-deadening wall and provided with a sounding board that constitutes another wall thereof, a conductor for leading sounds from the reproducer into the resonant compartment, and a sound amplifier supported on the sounding board for leading sounds from the conductor to an opening through the outer wall of the resonant compartment.

3. A sound reproducing machine comprising a table having a plane top and an underbody divided into a sound-muffling compartment and a resonant compartment separated therefrom by a sound-deadening wall and provided with a sounding board that

constitutes another wall thereof, sound reproducing means in the muffling compartment, a conductor for leading sounds from the reproducer into the resonant compartment, and a sound amplifier supported on the sound board for leading sounds from the conductor to an opening through the outer wall of the resonant compartment.

4. A sound reproducing machine comprising a table having a plane top, an underbody with a sound-muffling compartment and a resonant compartment separated therefrom by a sound-deadening wall, a sounding-board constituting the bottom of the resonant compartment, a base hinged in the bottom of the sound-muffling compartment to swing upwardly, a cover hinged in the table top over the sound-muffling compartment, sound reproducing apparatus on the base, a motor therefor suspended from the base, a conductor for leading sounds from the reproducer into the resonant compartment, and a sound amplifier supported on the sounding board for leading sounds from the conductor to an opening through the outer wall of the resonant compartment.

5. A sound reproducing machine comprising a table having a plane top, and an underbody with a sound muffling compartment and a resonant compartment separated therefrom by a sound-deadening wall, a non-resonant bottom wall for the muffling compartment, a sounding board for the bottom of the resonant compartment, a base hinged to close an opening in the muffling compartment bottom wall, a phonograph motor secured on the underside of the base with a turntable therefor on the upper side, a hol-

low fitting secured in the bottom wall extending into the resonant compartment, a sound tube swinging in the fitting over the turntable and having a sound-reproducing device on the free end, and a horn extending from the fitting toward an opening in the outer wall of the resonant compartment and resting on the sounding board.

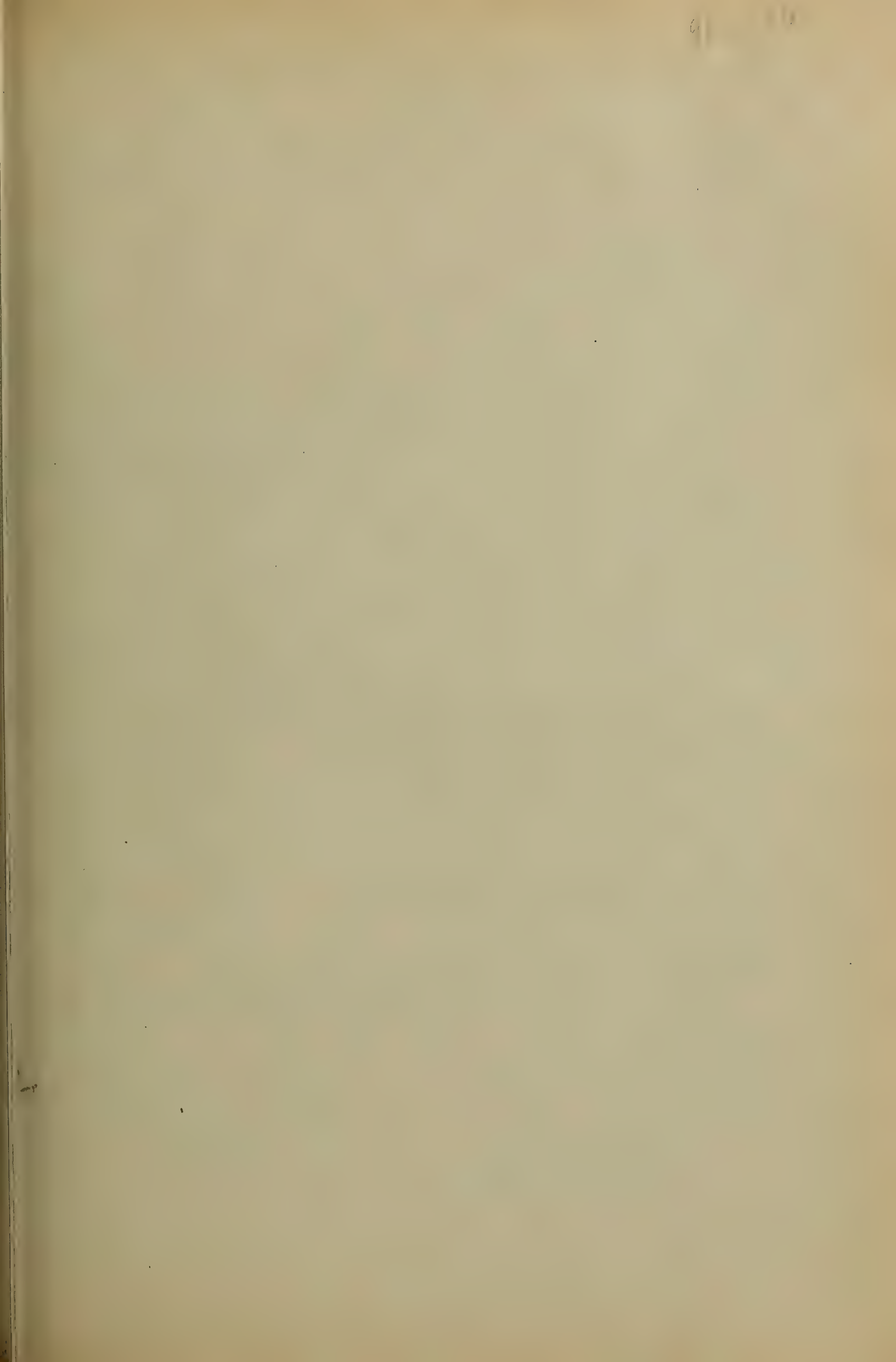
6. A sound reproducing machine comprising a table having a plane top, and an underbody with a sound muffling compartment and a resonant compartment separated therefrom by a sound-deadening wall, a non-resonant bottom wall for the muffling compartment, a sounding board for the bottom of the resonant compartment, a base hinged to close an opening in the muffling compartment bottom wall, a phonograph motor secured on the underside of the base with a turntable therefor on the upper side, a hollow fitting secured in the bottom wall extending into the resonant compartment, a sound tube swinging in the fitting over the turntable, a diaphragm and needle holder on the free end of the tube, a well in the muffling compartment bottom wall with which the needle holder may register, a needle tray pivotally secured to the bottom wall under the well, and a horn resting on the sounding board and extending from the fitting toward an opening in the outer wall of the resonant compartment.

In testimony whereof I affix my signature in presence of two witnesses.

STEPHEN M. WIRTS.

Witnesses:

OTTO F. BARTHEL,
ANNA M. DORR.



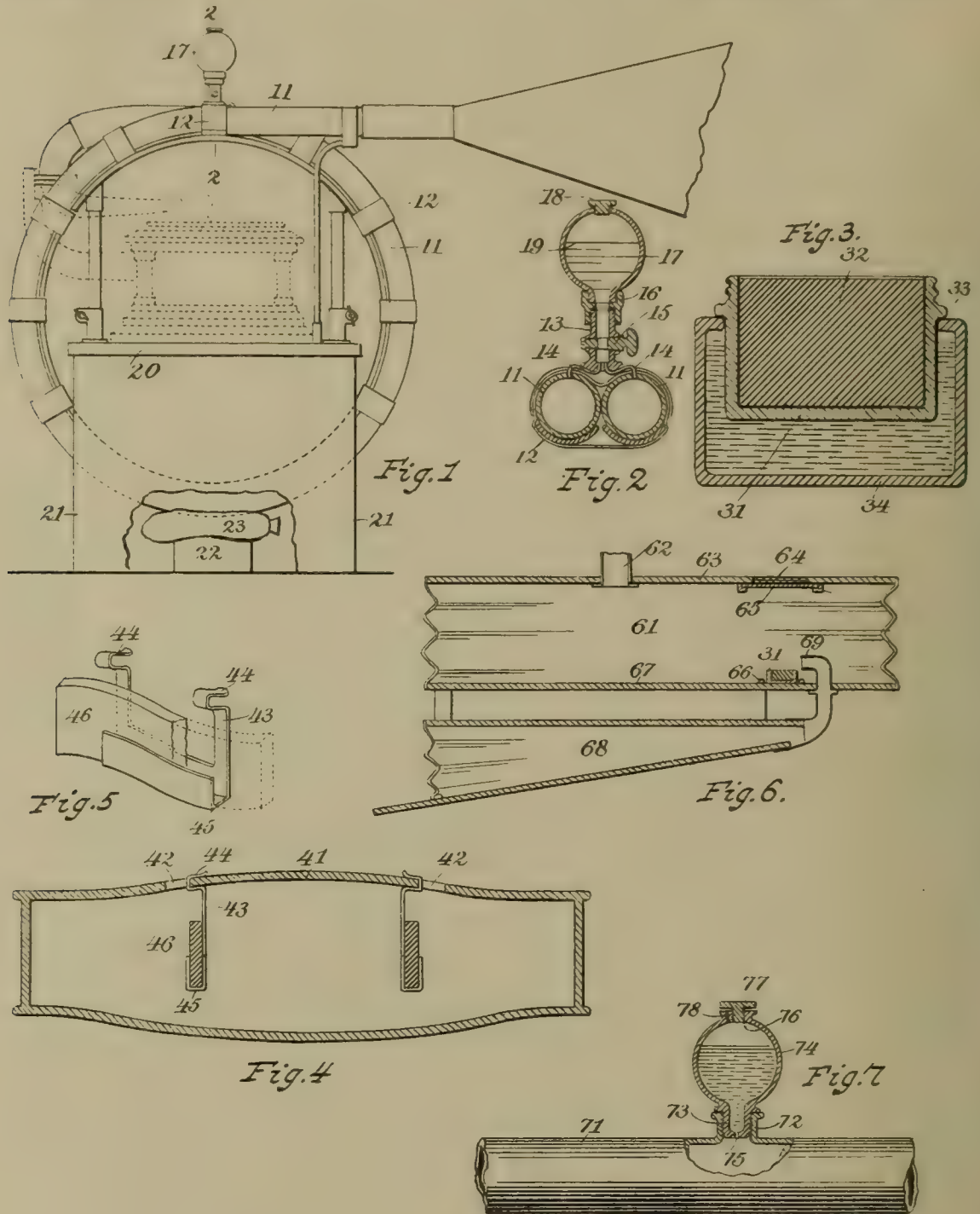
M. G. GRAHAM.

PROCESS FOR IMPROVING THE TONE OR TIMBRE OF MUSICAL INSTRUMENTS.

APPLICATION FILED DEC. 28, 1908.

966,010.

Patented Aug. 2, 1910.



Witnesses.

Charles S. Smith
B. M. D. Hurst

Miles G. Graham,
Inventor,

by Geo. L. Cooper
Attorney

UNITED STATES PATENT OFFICE.

MILES G. GRAHAM, OF ALBANY, NEW YORK.

PROCESS FOR IMPROVING THE TONE OR TIMBRE OF MUSICAL INSTRUMENTS.

966,010.

Specification of Letters Patent.

Patented Aug. 2, 1910.

Application filed December 28, 1908. Serial No. 469,537.

To all whom it may concern:

Be it known that I, MILES G. GRAHAM, a citizen of the United States, residing at Albany, New York, have invented a new and useful Improvement in Processes for Improving the Tone or Timbre of Musical Instruments, of which the following is a specification.

My invention relates to a process for adding to or impregnating the air contained within or passing through musical instruments or sound producing or reproducing devices with a non-aqueous vapor or gas, by which the air is resonated and the emitted sounds are amplified, purified or enriched in tone and timbre. I preferably produce this result by the evaporation within the instrument of a readily vaporizable solution, whereby gaseous or other molecules are liberated and commingled with the air both within and immediately outside of the instrument. It is found in practice that the sound waves passing through this modified or impregnated air produce on the ear an enriched, mellowed and more pleasing effect than those emitted from the same instrument under normal conditions, the improvement probably arising, in part at least, from a mingling and harmonizing of the produced overtones. After long experiment, I have found the best vaporizable material to consist of an alcoholic solution of resinous gums or oils, which may be perfumed as desired without detriment. I have had excellent results from a mixture composed as follows:

Alcohol	97%
Balsam fir	1%
Balsam tolu	1%
Hemlock-spruce oil	1%
	100%

with a slight addition of oil of rose and tincture of musk as a perfume. The proportions of the less volatile bodies may be considerably increased, or other resinous or like soluble materials may be substituted in whole or part for these, or a different non-aqueous solvent employed, without departing from my invention considered in its broadest sense. By the term "musical instrument" herein used, I include sound resonating devices, as phonograph horns, megaphones and the like.

For the purposes of my invention, musical

instruments may be divided into two classes; static, as percussion instruments and the like, where the vibrating air is practically confined within the casing of the instrument; and dynamic, as wind instruments, where continuous or pulsating air currents pass through the instrument. I will therefore illustrate and describe various forms of devices adapted to secure the results of my invention in typical instruments of each of these classes, it being of course understood that other suitable devices, within the constructive skill of the mechanic, may be employed, either in these instruments or in others not shown or mentioned.

In the drawings, Figure 1 is a side elevation and Fig. 2, a vertical section on an enlarged scale on the plane 2—2, Fig. 1, of a phonograph horn provided with one form of my device; Fig. 3 is a vertical section of a liquid container which is adapted to use in pianos and like instruments; Fig. 4 is a vertical transverse section of a violin body with two of my devices secured therein; Fig. 5 is an elevation of one of the devices of Fig. 4 detached; Fig. 6 is a vertical section of an organ wind chest and bellows provided with my device; Fig. 7 shows a form of my device applied to a piece of tubing which may form a part of any brass instrument, as a horn, cornet, tuba or the like.

The phonograph horn shown in Figs. 1 and 2 is, except for the device of the present invention, like that shown in my pending application for U. S. patent, filed Nov. 24th, 1908, which has received Serial Number 464,203. It consists in part of a tube 11 in two parallel coils conveniently held together by bands 12, on the uppermost of which is secured a nipple 13, from which small tubes 14 lead to the interior of each of the coils, see Fig. 2. The nipple is provided with a cock-plug 15 and is threaded at its upper end to engage with a coupling 16 in which is cemented a container 17, preferably of transparent material, as glass, and having an aperture at its top closed by a stopper 18. The vessel 17 may be provided with transverse ribs 19 or other marks, forming a series of graduations for indicating the volume of liquid delivered at any given time.

As shown in Fig. 1, the phonograph and novel horn are mounted on a stand 20 having legs or supports 21 spaced apart from each other, so that the lower part of the coiled

tube passes between them. I preferably arrange at a little distance below the coil 11 a shelf 22 or like means for holding means for heating the lower part of the coil, shown as an ordinary hot-water bag 23.

The operation of the device is as follows: The cock 15 being closed, the container 17 is filled with a suitable volatile liquid adapted to produce the desired results already described and the stopper 18 replaced. When it is desired to use the phonograph for reproducing any selection, the cock 15 is momentarily opened to permit the flow of a small amount of the liquid, measured by the graduations 19, into the coils 11. The liquid immediately begins to evaporate, and the vapor or gas thus produced impregnates the air within the horn, greatly improving the tone or timbre of the emitted sounds. In a very cold room, or when it is desired to produce an immediate striking effect, evaporation may be accelerated by the use of the hot-water bag 23, or by any other suitable means.

As a means of impregnating the vibrating air in a piano or similar instrument of the static type, I provide one or more of the devices shown in Fig. 3 of the drawings, which may be placed within the closed case of the instrument. As shown, it consists of a container cup 31 filled with a mass of absorbent material, shown as a block of charcoal 32, although cotton, sponge or the like may be used, which serves to retain the volatile liquid. The cup 31 may be threaded as shown for engagement with a cover, not shown, which is removed when the instrument is being played. The cup may be provided with a circumferential rib 33, for supporting it in the mouth of a vessel 34, which may be filled with hot water or sand to promote vaporization, as explained above. One or more of these previously filled cups 31, ordinarily without the heating device, are placed within the piano at any point where they will not interfere with the vibration of the strings, sounding-board, etc. Obviously, the effect will be to impregnate the air confined in the instrument with the beneficial result already described.

In Figs. 4 and 5 of the drawings, 41 designates the belly of a violin, provided with the usual S-holes 42.

43 is a clip, preferably of sheet metal, with a jaw 44 at its upper end for tightly grasping the wood of the violin belly and having an outwardly and upwardly turned flange 45 at its lower end for holding an absorbent block 46, which may be of charcoal, for retaining the volatile liquid. It will be seen that the clip and the block are so shaped as to be readily passed downward through the S-hole 42 and then moved laterally so as to engage the jaw 44 with the belly 41, see Fig. 4. The block 46, when dry, is

readily removed for refilling, which may be done by merely dipping it in the liquid for a few moments. It is obvious that, as before, the evaporation of the liquid will impregnate the air in the violin, with the desired result. It is also clear that in any instrument of the static type, like those so far described, the contained air may be impregnated by other means. Thus, the liquid may be sprayed into the horn, piano, violin or other instrument by means of an ordinary perfume atomizer, which is too well known to require illustration.

To impregnate the air in an instrument of the second, dynamic, class, where the vibrating air passes through and is emitted from the instrument, it is necessary to provide for a continuous supply of the vapor or gas.

In Fig. 6, 61 is the wind chamber of an organ, from which tubes, one of which is shown at 62, pass to the different reeds or pipes, as the case may be. The upper board 63 of the chamber is formed with an opening 64, closed by a slide 65, for inserting and removing a container 31, such as is shown in Fig. 3, and of any desired capacity. The cup 31 may be held in position by cleats 66 on the bottom board 67 of the chamber. Beneath the chest or chamber 61 is a bellows 68, the nozzle of which is bent at 69 within the chest 61, so that the air forced there-through passes directly over the container 31. The vigorous movement of the air from the nozzle 69 will act to rapidly volatilize the liquid in the container 31, so that all the air supplied to the organ reeds or pipes will be impregnated as before described. It will be clear without further illustration that the heating vessel 34 may be here used with the container 31 to promote evaporation.

Referring to Fig. 7 of the drawings, 71 is a part of a tube forming a portion of any "brass" wind instrument, preferably located near the mouthpiece. On its upper side it has a threaded nipple 72 for engaging with a co-acting nipple 73 on a liquid container 74, having a small aperture 75 at its lower end and a threaded opening 76 at its upper end, closed by a flange-headed stopper 77. Through the upper wall of the container 74 is pierced an air duct 78, closable by screwing down the stopper 77. When a musician plays upon the instrument, he slightly unscrews the stopper 77, thus permitting air to enter at the duct 78, when the liquid will issue, drop by drop, from the aperture 75 and fall into the tube 71, the frequency of the drops being regulated by the stopper 77. The resonating liquid will of course be assisted in its volatilization by the strong air current passing through the tube 71, and the tone or timbre of the instrument will be improved by the vapor thus produced.

I am aware that it has heretofore been proposed to form a vibrating portion of a

musical instrument with a container for a mass of water. This is entirely foreign to my invention, as neither the insignificant quantity, nor the quality, of the vapor thus accidentally produced would serve to resonate or modify the emitted sound waves in the advantageous manner above described.

As I have already suggested, the process of impregnating the air contained in or passing through a musical instrument with a vapor or gas distinct therefrom, which process forms the subject of my invention, is quite independent of any means for producing such vapor or gas by volatilization. I do not therefore limit my invention except as set forth in the claims.

What I claim is:

1. The art or process of improving the tone or timbre of a musical instrument by impregnating the air therein with a non-aqueous vapor or gas.

2. The art or process of improving the tone or timbre of a musical instrument by impregnating the air therein with a non-aqueous vapor or gas produced by the evaporation of a volatile substance.

3. The art or process of improving the tone or timbre of a musical instrument by impregnating the air therein with a non-aqueous vapor or gas produced by the continuous evaporation of a volatile substance.

4. The art or process of improving the tone or timbre of a musical instrument by impregnating the air therein with a vapor or gas produced by the evaporation of a volatile non-aqueous solution of vegetable products.

5. The art or process of improving the tone or timbre of a musical instrument by impregnating the air therein with a vapor or gas produced by the evaporation of a volatile non-aqueous solution of resinous materials.

6. The art or process of improving the tone or timbre of a musical instrument by impregnating the air therein with a vapor or gas produced by the evaporation of an alcoholic solution of resinous or like materials.

7. The art or process of improving the tone or timbre of a musical instrument by impregnating the air therein with a vapor or gas produced from a volatile non-aqueous liquid.

8. The art or process of improving the tone or timbre of a musical instrument by impregnating the air therein with a vapor or gas produced from a continuously supplied volatile non-aqueous liquid.

9. The art or process of improving the tone or timbre of a musical instrument by impregnating the air therein with a vapor or gas produced from a continuously supplied alcoholic solution of vegetable products.

10. The art or process of improving the tone or timbre of a musical instrument by impregnating the air therein with a vapor or gas produced from a continuously supplied alcoholic solution of resinous or like materials.

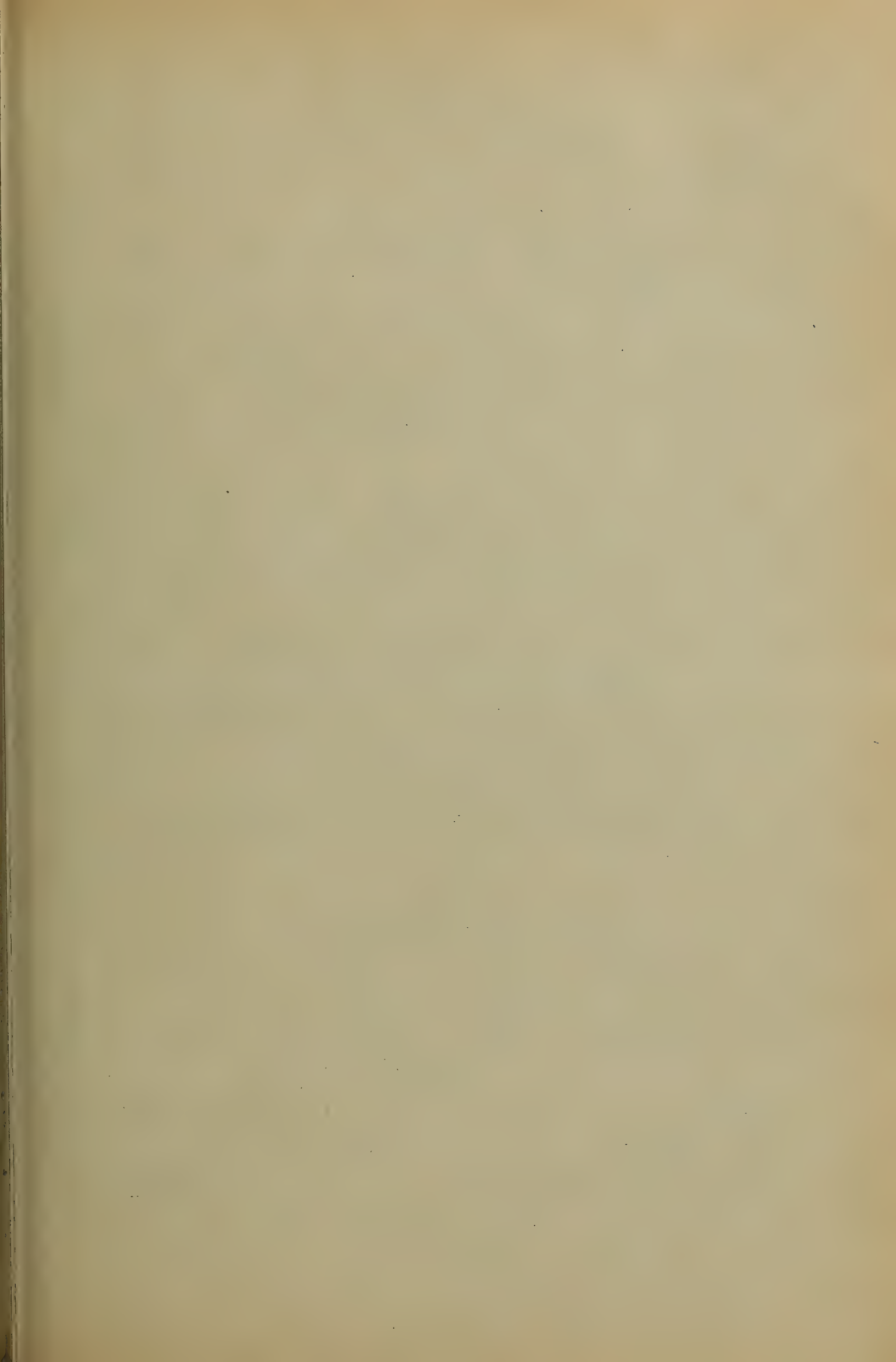
11. The art or process of improving the tone or timbre of a musical instrument by impregnating the air therein with a vapor or gas produced from an alcoholic solution of balsam fir, balsam tolu and hemlock-spruce oil.

12. The art or process of improving the tone or timbre of a musical instrument, which consists in supplying to the interior thereof a quantity of volatile material and assisting the evaporation thereof by artificial heat.

MILES G. GRAHAM.

Witnesses:

GEO. L. COOPER,
CHARLES SELKIRK.



W. C. RUNGE.
 MANDREL SLEEVE FOR PHONOGRAPH RECORDS.
 APPLICATION FILED APR. 22, 1909.

966,771.

Patented Aug. 9, 1910.

Fig. 1.

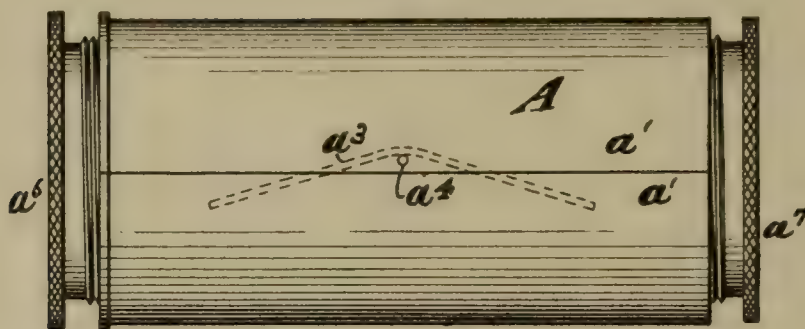


Fig. 2.

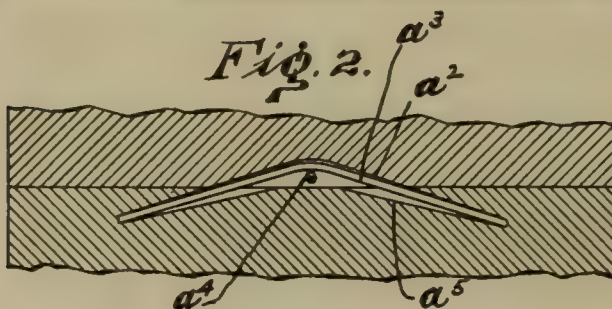


Fig. 3.

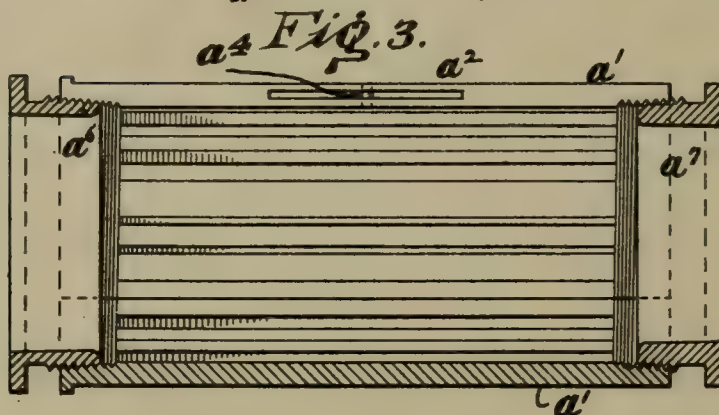
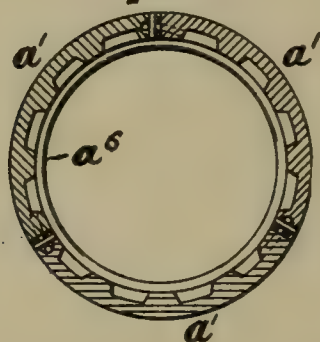


Fig. 4.



WITNESSES

May 9. 1910

Walter C. Runge

Walter C. Runge INVENTOR

BY Dickerson Brown Regeuer & Maltz

HIS ATTORNEYS

UNITED STATES PATENT OFFICE.

WALTER C. RUNGE, OF CAMDEN, NEW JERSEY, ASSIGNOR TO ROYAL PHONE AND PHONOGRAM COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MAINE.

MANDREL-SLEEVE FOR PHONOGRAPH-RECORDS.

966,771.

Specification of Letters Patent.

Patented Aug. 9, 1910.

Application filed April 22, 1909. Serial No. 491,484.

To all whom it may concern:

Be it known that I, WALTER C. RUNGE, a citizen of the United States, and a resident of the city of Camden, county of Camden, and State of New Jersey, have invented certain new and useful Improvements in Mandrel-Sleeves for Phonograph-Records, of which the following is a specification.

Some phonographs are provided with tubular mandrel sleeves which may be slipped on and off the arbor of a phonograph and have phonograph records tubularly engaged with them.

My invention relates to such a mandrel sleeve made capable of expanding and contracting for the purpose of respectively securing and releasing a phonograph record.

In the accompanying drawings: Figure 1 is a side view of a mandrel sleeve embodying my improvement. Fig. 2 is a section through a portion of the circumference to illustrate the means of connecting segments which are comprised in the mandrel sleeve. Fig. 3 is a central longitudinal section of the mandrel sleeve. Fig. 4 is a transverse section of the mandrel sleeve.

Similar letters of reference designate corresponding parts in all the figures.

A designates the body of the mandrel sleeve. It is of tubular form and made of a number of longitudinal segment shaped sections a^1 . While these sections may be of any desired number, I have only shown three in this example of my invention, each of the three forming a third of the body.

The sections of the body are connected together at their longitudinal edges and in such a manner that they may yield independently so that the body as a whole may expand and contract. As here shown, a groove a^2 is formed in one of the longitudinal edges of each section a^1 and in this groove a spring a^3 is introduced. This spring consists of a strip of resilient metal and is bent longitudinally into bow shape. Its middle portion fits in the groove a^2 and is retained there by a pin a^4 which extends transversely through the groove. The ends of the spring a^3 protrude into cavities a^5 formed in the opposite edge of an adjacent section a^1 and extending obliquely therein.

Inside the several sections are made flaring at the ends and are screw threaded to receive rings a^6 and a^7 which are tapered and screw threaded to engage with the flaring

screw threaded end portions of the sections a^1 of the mandrel sleeve. As here shown, the rings a^6 and a^7 have flanges and the latter are milled at the edges to facilitate the manipulation of the rings. Preferably the screw threads at both ends of the mandrel sleeve will be of the same character, or in other words, will both be right hand screws and of the same pitch. Obviously when the rings are rotated in reverse directions to enter farther into the mandrel sleeve, the latter will be expanded. A contrary manipulation of the rings will permit the mandrel sleeve to contract. Preferably the mandrel sleeve will have at one end a circumferential lip of which segments will be formed upon the several sections a^1 . This lip will form a stop to insure the proper positioning of a record upon the mandrel sleeve.

Before inserting my mandrel sleeve into a phonograph record, said sleeve is contracted by screwing outward the rings a^6 and a^7 , if indeed the sleeve is not already small enough to slip easily into the record. The record having been placed upon the sleeve, the rings a^6 and a^7 are screwed inward so as to expand the sleeve or increase its diameter, thereby causing the said sleeve to fit tightly within the record. Such rotation of the rings a^6 and a^7 to expand the sleeve, may be effected most readily by grasping one of said rings in one hand and the other of said rings in the other hand, and rotating the two rings simultaneously but in opposite directions; the motion being a slight twisting motion such as is readily given by the hands. The rings a^6 and a^7 being entirely separate and capable of independent rotation in opposite directions, it is not necessary to hold the record itself, when so turning said rings; and indeed, the fact that the two rings a^6 and a^7 are independent obviates all necessity of fingering the record itself in doing this. The record preferably used is one that is flexible and capable of some distension; and by expanding the mandrel in this way, it may be expanded sufficiently far to put the record under tension, and under uniform tension. The fact that the two rings a^6 and a^7 are independent practically assures that, in turning said rings, the record will be put under uniform tension throughout, because if the mandrel starts to place one end of the sleeve under greater tension than the other end, the ring a^6 or a^7 , at that

end where the greater tension is initially, will cease rotating in the mandrel sleeve, before the other ring will cease rotating, so that the final result is to produce substantially uniform tension of the record at both ends thereof. To remove a record from the mandrel sleeve the rings a^6 and a^7 are rotated backward, thus contracting the mandrel sleeve to such extent that it may be slipped out of the record easily.

What I claim is:

1. A phonograph record mandrel sleeve comprising in combination an expandible tubular body and a plurality of independent expanding means therefor, capable of independent operation to cause the expansion or contraction of said sleeve at will.

2. A phonograph record mandrel sleeve comprising in combination an expandible tubular body and two independent expanding means therefor, located at opposite ends of said sleeve, and capable of independent operation to cause the expansion or contraction of said sleeve at will.

3. A phonograph record mandrel sleeve comprising in combination an expandible tubular body composed of segments yieldingly connected together, and a plurality of independent expanding means therefor, capable of independent operation to cause the expansion or contraction of said sleeve at will.

4. A phonograph record mandrel sleeve comprising in combination an expandible tubular body and a plurality of independent expanding means therefor, operable by rotation, relative to said sleeve, to cause the expansion or contraction of the latter, and each capable of independent rotation.

5. A phonograph record mandrel sleeve comprising in combination an expandible tubular body, and expanding means therefor, comprising a plurality of rotary rings capable of being rotated independently with respect to one another, and each provided with inclined surfaces arranged to coact with portions of said tubular body for the purpose of causing expansion or contraction of said body, according to the direction in which such rings are rotated.

6. A phonograph record mandrel sleeve

comprising in combination an expandible tubular body, and expanding means therefor, comprising a plurality of rings rotatable independently with respect to one another, and provided with surfaces tapering externally with respect to the axis of the rings, and arranged to coact with end portions of said tubular body to cause expansion or contraction thereof, according to the direction said rings are rotated.

7. A phonograph record mandrel sleeve comprising in combination an expandible tubular body, and expanding means therefor, comprising a plurality of expanders arranged to cause expansion or contraction of such sleeve by their rotation, such expanders independently rotatable with respect to one another and arranged to be rotated in opposite directions relatively, for the purpose of expanding said sleeve, and also for the purpose of contracting said sleeve.

8. A phonograph record mandrel sleeve comprising in combination an expandible tubular body, and expanding means therefor, comprising a plurality of expanders arranged to cause expansion or contraction of such sleeve by their rotation, such expanders independently rotatable with respect to one another and arranged to be rotated in opposite directions relatively, for the purpose of expanding said sleeve, and also for the purpose of contracting said sleeve, said expanders adapted for manual rotation.

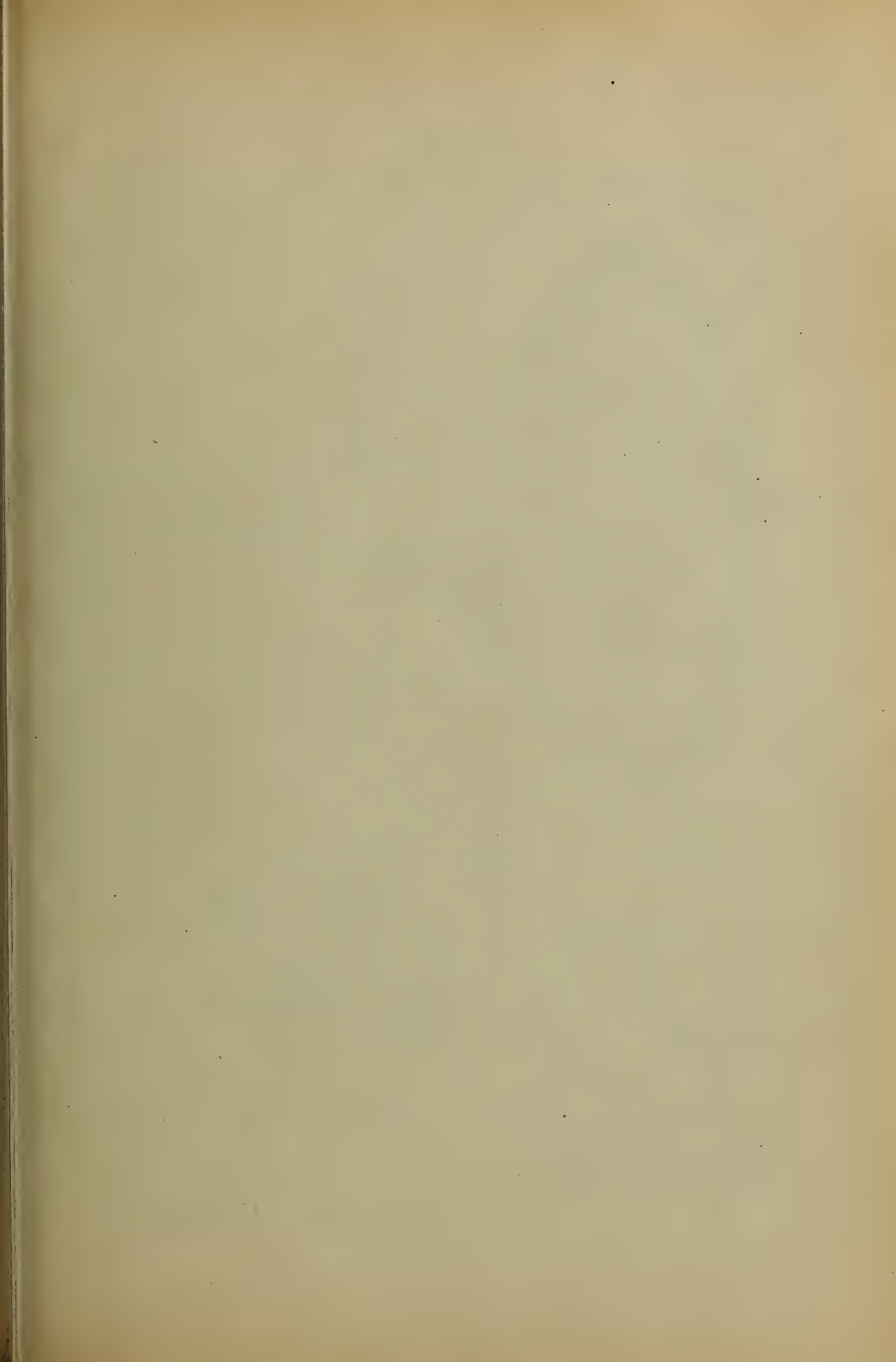
9. A phonograph record mandrel sleeve comprising in combination an expandible tubular body, and screw threaded expanders screwing into the ends of the said sleeve, and capable of independent rotation with respect to one another, said expanders arranged to be rotated in opposite directions relatively, to expand said sleeve, and likewise to cause contraction of said sleeve, and adapted for manual operation.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WALTER C. RUNGE.

Witnesses:

FRANK E. RAFFMAN,
PAUL H. FRANK.



J. A. DANIS.

METAL HORN.

APPLICATION FILED JAN. 14, 1910.

967,618.

Patented Aug. 16, 1910.

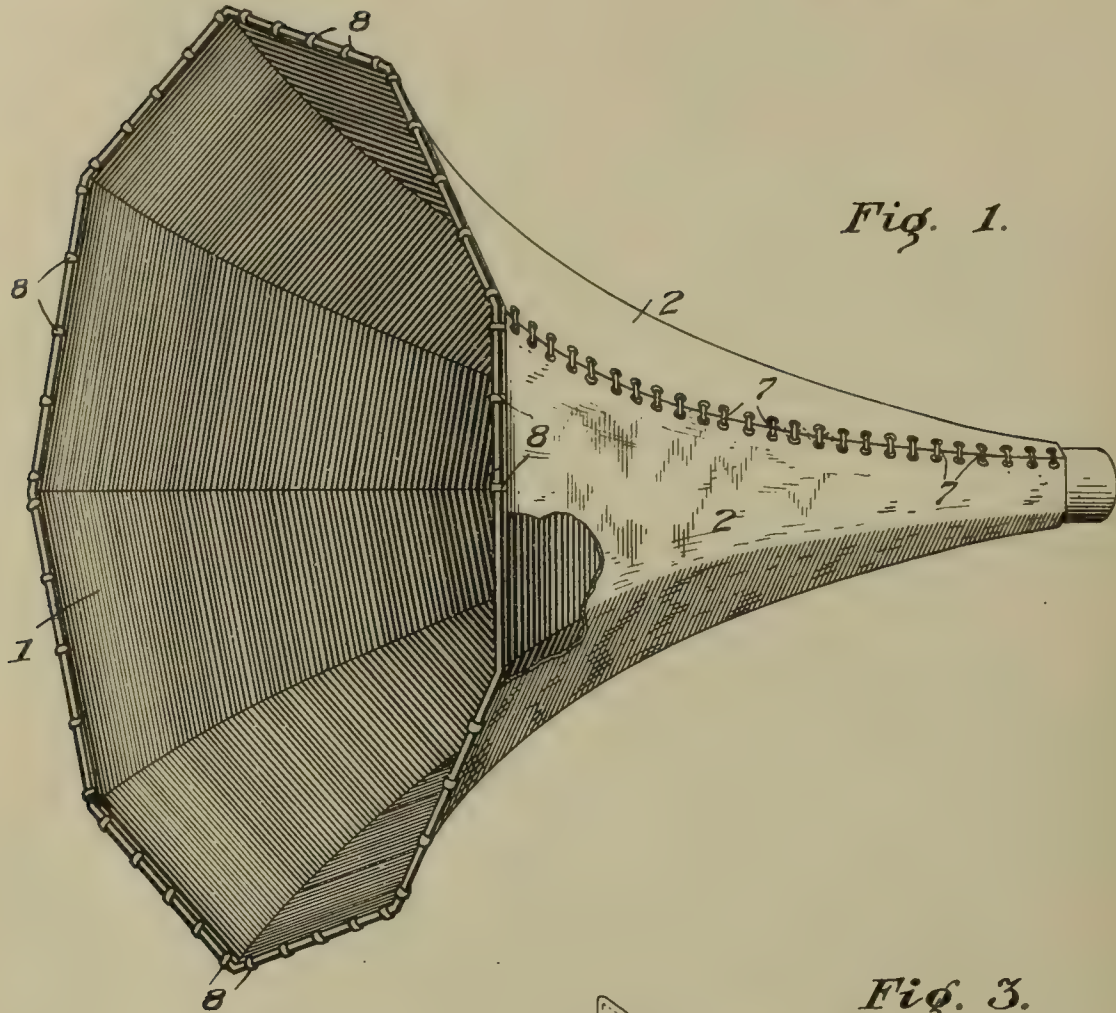


Fig. 2.

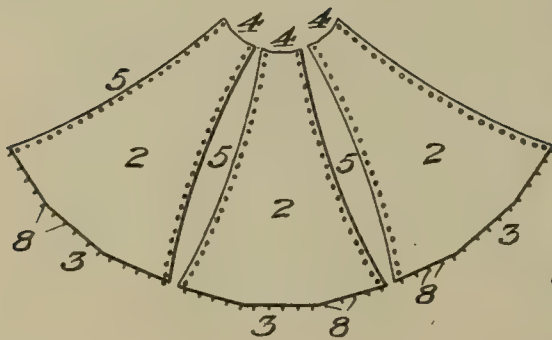
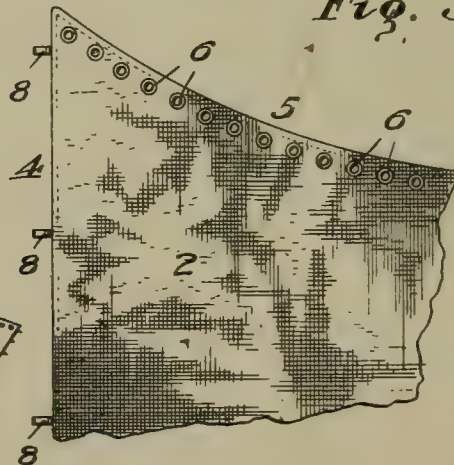


Fig. 3.



Witnesses:
Edward Danis
Alphonse C. Dennis

Inventor:

Joseph Adolov Danis

UNITED STATES PATENT OFFICE.

JOSEPH ADELOR DANIS, OF BURLINGTON, VERMONT.

METAL HORN.

967,618.

Specification of Letters Patent. Patented Aug. 16, 1910.

Application filed January 14, 1910. Serial No. 538,168.

To all whom it may concern:

Be it known that I, JOSEPH ADELOR DANIS, a citizen of the United States, residing at the city of Burlington, in the county of Chittenden and State of Vermont, have invented a new and useful Improvement in Metal Horns, of which the following is a specification.

This invention relates to horns or amplifiers for phonographic apparatus, and its object is to provide means for dampening the vibrations of said horn when made of metal, so that the tone of the instrument will be sweeter and smoother. The means which I use to accomplish this result comprises a cover for the horn made of textile fabric and detachably secured to said horn. To insure a good fit, the cover is made in sections, provided with means for lacing them together, and at its larger end said cover is also provided with hooks which catch over the edge of the metal horn and hold the cover tightly stretched, and in close contact with said horn.

In the accompanying drawing, Figure 1 is a perspective view of a metal horn or amplifier provided with my improved cover. Fig. 2 shows the sections from which the cover is made, and Fig. 3 is a view on a larger scale of one corner of a section showing the eyelets and hooks with which it is provided.

The horn 1 is made of metal in the customary bell-mouthed or flaring shape. The cover is composed of a plurality of sections 2 cut out of textile material. The combined

length of the larger ends 3 of said sections is just sufficient to encircle the mouth of the horn, while the combined lengths of the smaller ends 4 of said sections will just go around the small end of said horn. The edges 5 of the sections are concaved so that the cover will snugly hug the horn throughout its entire length. Along said curved edges the sections are provided with eyelets 6 to receive the lacings 7 by which the sections are held together. When the completed cover is drawn over the horn, the hooks 8 along the large ends of the sections are pulled over the edges of the mouth of the horn, where they are retained by the elasticity of the textile fabric of which the cover is made, so that it will fit closely and smoothly all over the outer surface of the horn. It can be readily removed by disengaging the hooks and slipping it off over the small end of the horn, after removing the latter from the talking machine.

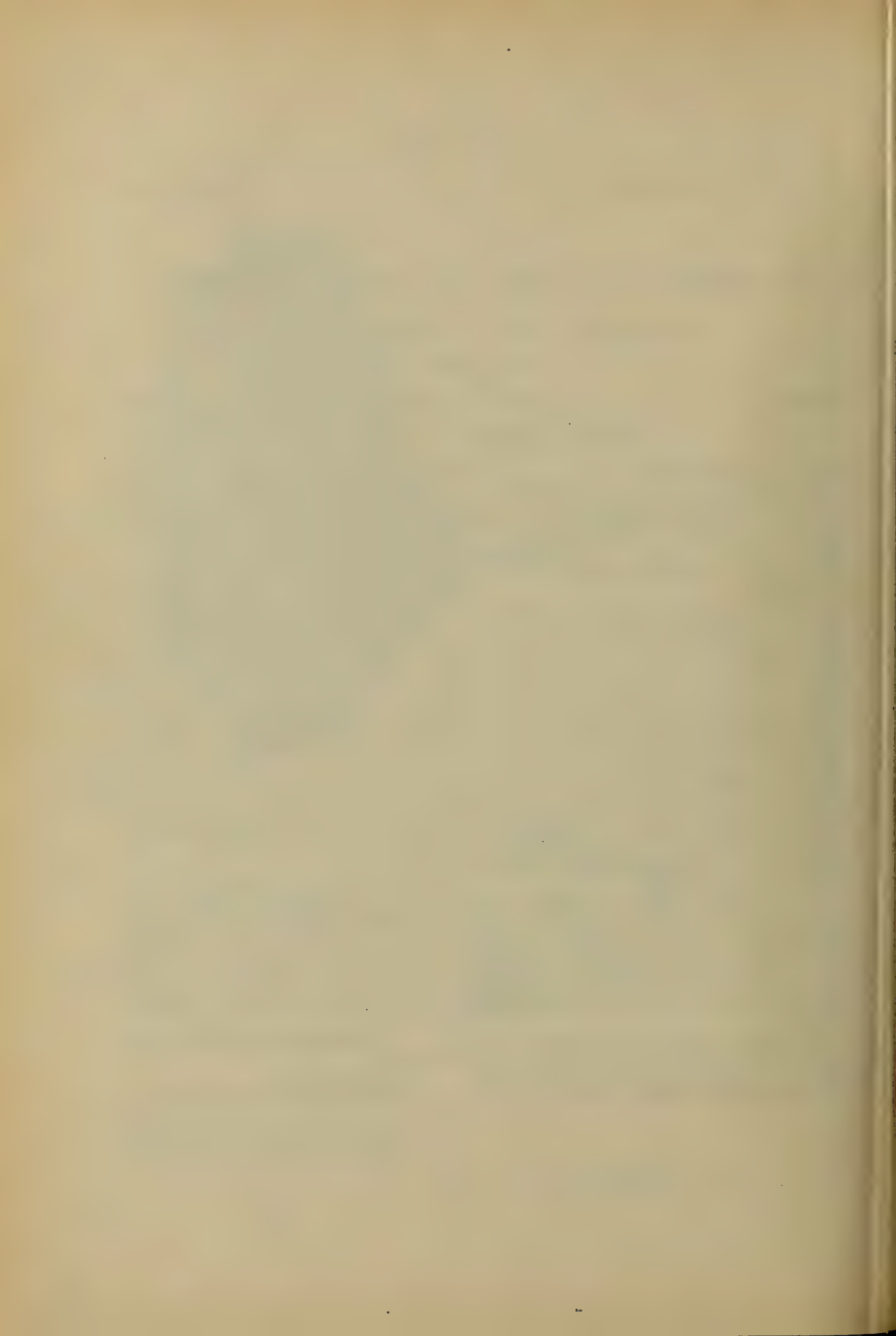
Claim:

The combination with the metal horn of a talking machine, of a detachable cover of textile material, composed of sections shaped to fit said horn snugly and laced together along their edges, and hooks at the larger end of said cover adapted to be engaged with the edge of the mouth of said horn and retained there by the elasticity of the material.

JOSEPH ADELOR DANIS.

Witnesses:

EDWARD DENNIS,
ARTHUR DENNIS.



T. KRAEMER.
TALKING MACHINE.

APPLICATION FILED JULY 30, 1908.

968,483.

Patented Aug. 23, 1910.

2 SHEETS—SHEET 1.

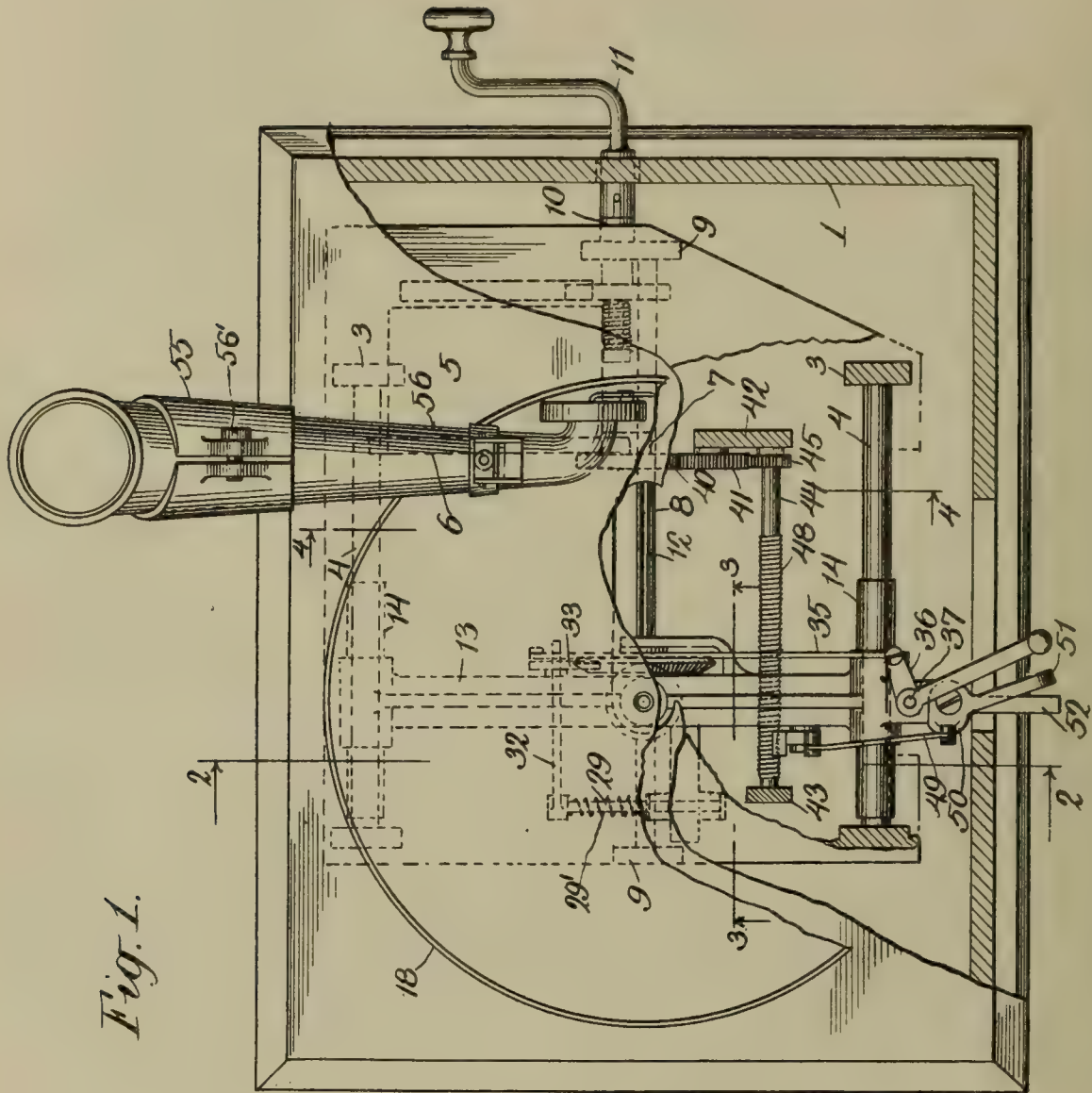


Fig. 1.

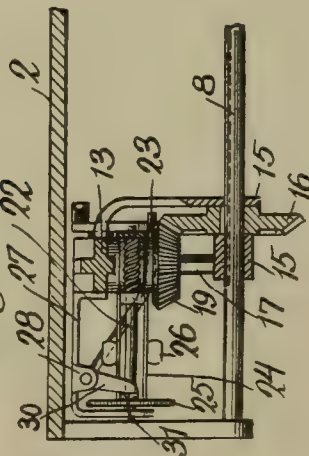


Fig. 3.

WITNESSES:

J. Edwards
M. A. Rheinisch

INVENTOR

Thomas Kraemer

BY

J. Edwards

ATTORNEY

968,483.

Patented Aug. 23, 1910.

2 SHEETS—SHEET 2.

Fig. 2.

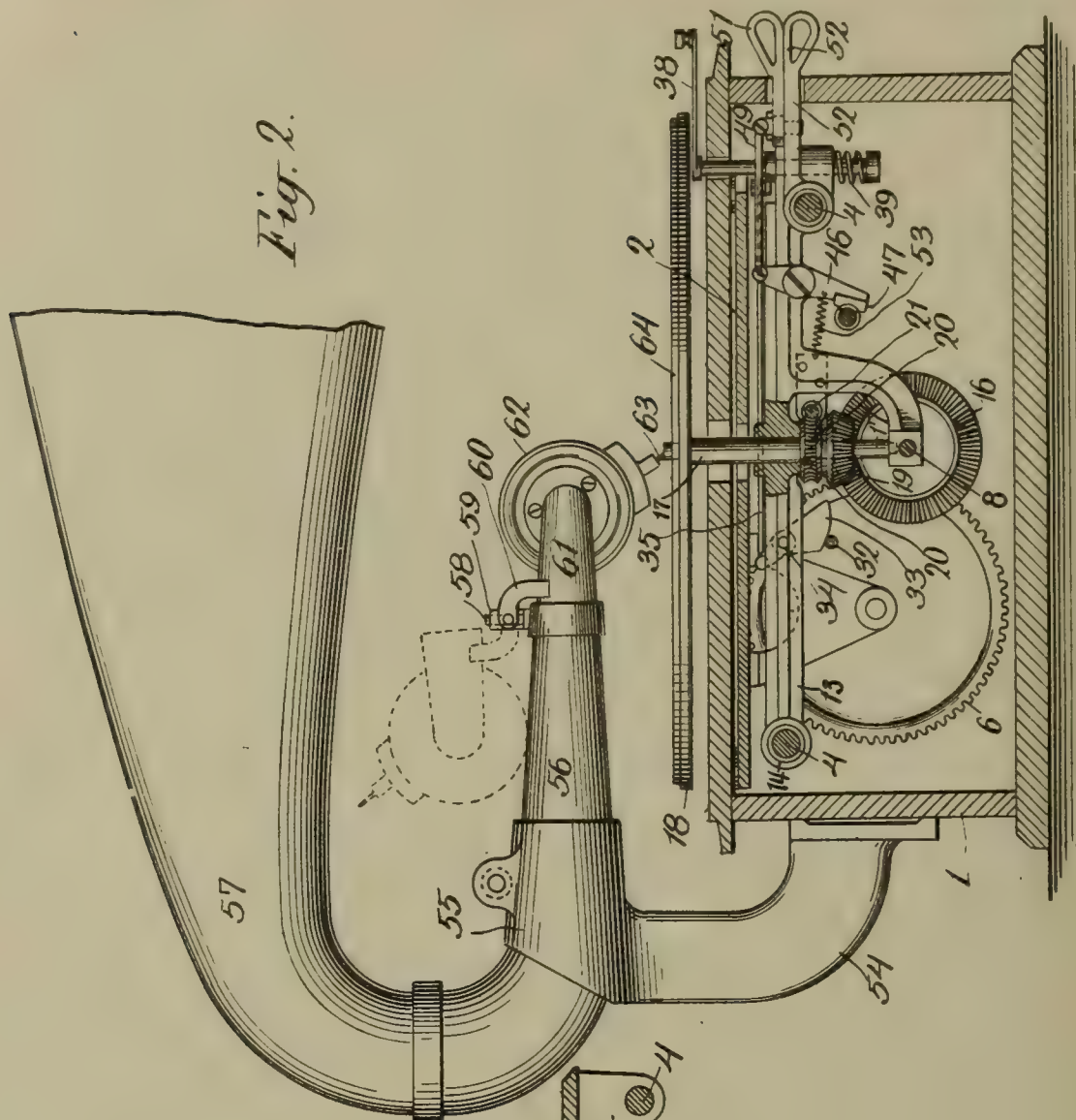
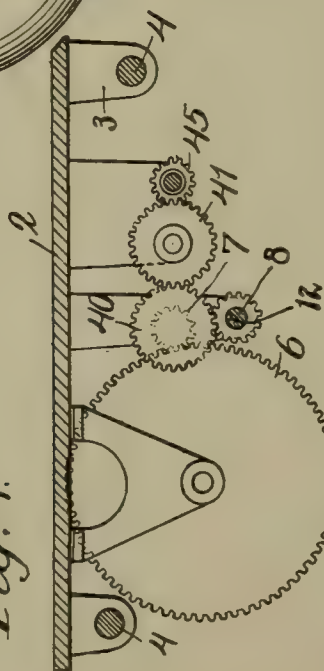


Fig. 4.



WITNESSES:

M. A. Rheinisch.

INVENTOR

Thomas Kraemer.

BY

Edwards.
ATTORNEY

UNITED STATES PATENT OFFICE.

THOMAS KRAEMER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HAWTHORNE & SHEBLE MANUFACTURING COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

TALKING-MACHINE.

968,483.

Specification of Letters Patent.

Patented Aug. 23, 1910.

Application filed July 30, 1908. Serial No. 446,039.

To all whom it may concern:

Be it known that I, THOMAS KRAEMER, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

This invention relates to talking machines and is directed to the provision of a machine of an improved construction in which the relative movement of the sound-record and the reproducing mechanism necessary to permit the stylus of the reproducing mechanism to track in the record-groove throughout the several convolutions thereof is affected by moving the sound-record and the turntable on which it is supported bodily in the plane in which they lie.

In accordance with my invention, a turntable is provided for supporting a disk record and this is so mounted as to permit of rectilinear movement thereof in the plane in which it lies. A motor mechanism is employed for rotating the turntable on its axis and this motor mechanism may also be arranged to effect the lateral movement of the turntable. The reproducing mechanism is stationarily mounted with respect to the turntable so far as concerns movement of that mechanism radially of the turntable; if desired the reproducing mechanism may be so mounted as to permit of movement transverse to the plane of the turntable so that the stylus thereof may track faithfully in the record-groove and may be moved to an inoperative position while changing records.

The devices whereby the motor mechanism, in addition to rotating the turntable, effects the rectilinear movement thereof, are so constructed as to move the turntable bodily as it is rotated at the speed necessary to enable the stylus of the reproducing mechanism to follow the record-groove properly. For this purpose the motor mechanism may be arranged to move with the turntable if desired, but I prefer to mount the motor mechanism stationarily and connect it to the turntable by devices which will permit of the necessary relative movement of these two parts while maintaining the operative

connection between them, as for instance, a telescoping shaft or a spline.

The preferred embodiment of my invention is illustrated in the accompanying drawings in which—

Figure 1 is a top view of a talking machine, broken away and sectioned in part, Fig. 2 is a sectional elevation of the same, the section being on line 2—2 of Fig. 1, and Figs. 3 and 4 are detail views in section on lines 3—3 and 4—4 of Fig. 1.

Referring to these drawings, 1 indicates the motor-box of a talking machine having a frame 2 secured to the under side of the cover thereof. Depending from the under side of this frame are supports 3 in which the ends of 2 rods 4, 4 are secured, these rods being parallel to each other and located adjacent to opposite edges of the frame 2. To the under side of frame 2 is secured a motor mechanism of any suitable construction, but preferably a spring-motor 5 of the type commonly employed for driving the turntables of talking machines. This motor mechanism drives a gear 6 which meshes with a pinion 7 secured upon a shaft 8 which is mounted for rotation in bearings formed in standards 9 depending from the frame 2. One of the standards 9 has a bearing formed therein for a rewinding shaft 10 by which the spring of the motor 5 is wound up, the end of this shaft 10 being adapted to be engaged by a winding handle 11 of the usual construction. The shaft 8 has a groove cut therein and extending lengthwise thereof.

A movable frame 13 has sleeves 14 of substantial length at opposite ends thereof through which the rods 4, 4 extend, and this frame carries the rotatable turntable of the machine. Referring to Fig. 3, it will be seen that frame 13 has two depending arms 15 integral therewith provided with openings through which the shaft 8 extends, and a bevel-gear 16 lies between these two arms 15 and is splined on shaft 8 by means of a key entering the groove 12. One of the arms 15 and the body portion of frame 13 have bearings formed therein for a vertically-disposed shaft 17 which extends upwardly through a slot in the cover of the motor-box 1 and has the turntable 18 of the

machine secured upon its upper end. Secured on shaft 17 is a bevel-gear 19 meshing with the bevel-gear 16. Immediately above the bevel-gear 19 and also secured upon shaft 17, is a worm-wheel 20, with which meshes a worm 21 formed on the governor shaft 22. A collar 23 is secured on shaft 22 and is connected by flat springs 24 with a collar 25 which is loose on shaft 22, and each of the springs 24 carries a weight 26. The outer end of the governor shaft 22 is carried in a bearing formed in the end of an arm 27 and this arm is provided with ears 28 in which are formed bearings for a short shaft 29. This shaft has two arms 30 depending therefrom and each carrying a brake-pad 31 on the end thereof adapted to contact with the collar 25. The end of shaft 29 has an arm 32 secured thereto, the opposite end of which extends under a cam 33 pivotally mounted at 34 upon the frame or carriage 13. Above its pivotal point the cam 33 has a rod 35 connected thereto, the other end of which is pivotally connected to the end of a crank 36 on a shaft 37 mounted in a bearing formed in frame 13. This shaft extends upward through a slot in the cover of the motor-box 1 and has an operating handle 38 secured thereto. The lower end of shaft 37 extends through the bearing for the shaft and has a spring 39 coiled thereon and lying between the bearing and a head formed on the shaft so as to hold the shaft in any position to which it is moved. A spring 29' coiled on shaft 29 acts thereon to hold the end of arm 32 in contact with the cam 33. It will be seen that by turning shaft 37 by means of handle 38, the brake-pads 31 can be moved toward and away from the loose collar 25 so as to start, stop and regulate the speed of rotation of the turntable.

Secured on shaft 8 is a gear 40 which meshes with a gear 41 mounted upon a standard 42 depending from the frame 2. In this standard 42 and a similar standard 43 are formed bearings for a shaft 44 which carries a gear 45, meshing with the gear 41. Shaft 44 has a screw-thread formed thereon, the pitch of which is dependent upon the pitch of the spiral record-groove in the records which are to be reproduced on the machine. Pivotaly mounted upon the frame 13 is a lever 46 carrying at its lower end a half-nut 47 adapted to engage with the threads of the screw 48 on shaft 44. The upper end of lever 46 is connected by a rod 49 to the head 50 of a handle 51 pivotally mounted upon the frame 13. Below this handle is a similar handle 52 which is integral with the frame 13, the two handles 51 and 52 projecting through a slot in the side of the motor-box 1. A spring 53 is connected at one end to lever 46 and at the other end to the frame 13 so as to hold the

half-nut 47 normally in engagement with the screw 48. Preferably, the thread of screw 48 is in the form of a ratchet so that the half-nut 47 will coast more reliably therewith.

Secured to the side of the motor-box and extending upwardly therefrom is a support 54, the upper end of which has the form of a split sleeve 55, the two parts thereof being adapted to be drawn together by a bolt 56'. This sleeve is adapted to grip and support a sound-conveying tube which is, preferably, a tone-arm 56 and amplifying horn 57. At the small end of the tone-arm 56 is a vertically disposed pin 58, adapted to extend through a sleeve 59 to which arms 60 are pivotally connected so as to turn on a horizontal axis. These arms 60 support a short length of tubing 61, one end of which is adapted to telescope slightly with the end of the tone-arm 56, and the other end of which carries the sound-box 62 having a stylus 63 adapted to track in a groove of the record 64 on the turntable 18. By this construction it will be seen that the sound-box and its stylus are held against movement in a direction parallel to the plane of the sound-record 64, but the sound-box and the short tube 61 may be turned about a horizontal axis to carry the sound-box to inoperative position, as shown by the dotted lines in Fig. 2, while withdrawing one record 64 and substituting another therefor.

The operation of the machine will now be described. Fig. 1 shows the parts in the position for starting, the stylus of the reproducer being at the beginning of the groove in record 64. The end of handle 38 is turned to the right in Fig. 1, thus turning cam 33 in a direction to permit the free end of rod 32 to be raised more or less and the shaft 29 to be rocked in its bearings under the influence of spring 29' so as to carry the brake-pads 31 away from the collar 25. The motor mechanism can now operate to rotate the turntable 18 and the feed-screw 48 since the gear 6 drives shafts 8 and 17 through gears 7, 16 and 19 and feed-screw 48 through gears 40, 41 and 45. As the feed-screw 48 is rotated, it acts upon the half-nut 47 mounted on the frame or carriage 13 to move that frame and all the parts carried thereby to the right in Fig. 1 and this movement is directly proportional to the speed of rotation of the turntable so that the stylus of the reproducer may track faithfully in the record-groove in disk 64. When the reproduction has been concluded, the operator grasps the handles 51 and 52 between the thumb and fore-finger and by moving them together so that handle 51 lies directly over handle 52, the half-nut 47 will be drawn out of engagement with the feed-screw 48 against the tension of spring 53. This having been done, the operator moves

the two handles 51 and 52 together to the left, thereby sliding the frame 13 along on the rods 4, 4 back to its initial position. Then on releasing the handles, the half-nut 5 47 will be drawn into engagement with the feed-screw 48 by spring 53, thereby moving the handle 51 relatively to the handle 52 to the position shown in Fig. 1 and the parts are in readiness for another reproduction.

10 By turning the handle 38 either at the conclusion of the first reproduction or after the parts have been brought back to initial position, the motor may be stopped by the engagement of the brake-pads 31 with the collar 25 and by adjusting handle 38 between its extreme positions any speed of rotation of the turntable desired may be obtained.

Having now described my invention, what I claim as new therein and desire to secure 20 by Letters Patent is as follows:

A talking-machine comprising a motor-box, a pair of rods secured to the under side of the cover thereof, a frame slidable on said rods, a motor secured to the under side of 25 said cover, two members splined together and rotatable on a horizontal axis, one of said members being secured to the under side

of said cover and driven by said motor and the other of said members being mounted upon said frame, a feed-screw mounted for 30 rotation on the under side of said cover, means actuated by the motor for rotating the feed-screw, a shaft mounted on said frame and rotatable about a vertical axis, intermeshing gears carried by said shaft and 35 said member mounted upon the frame, a turn-table for a talking-machine record mounted upon said shaft above the cover of the motor-box, a half-nut pivotally mounted on said slidable frame, an operating lever 40 pivotally mounted on said slidable frame and arranged to move said half-nut into and out of engagement with said feed-screw, and reproducing mechanism held against lateral movement and adapted to coact with a rec- 45 ord on said turn-table, substantially as set forth.

This specification signed and witnessed this 28th day of July, 1908.

THOMAS KRAEMER.

Witnesses:

EMIL SCHENELE,
H. MUHLSCHLEGEL.

J. D. BOWERS & L. MAYHUE.

PHONOGRAPH.

APPLICATION FILED NOV. 10, 1909.

968,530.

Patented Aug. 30, 1910.

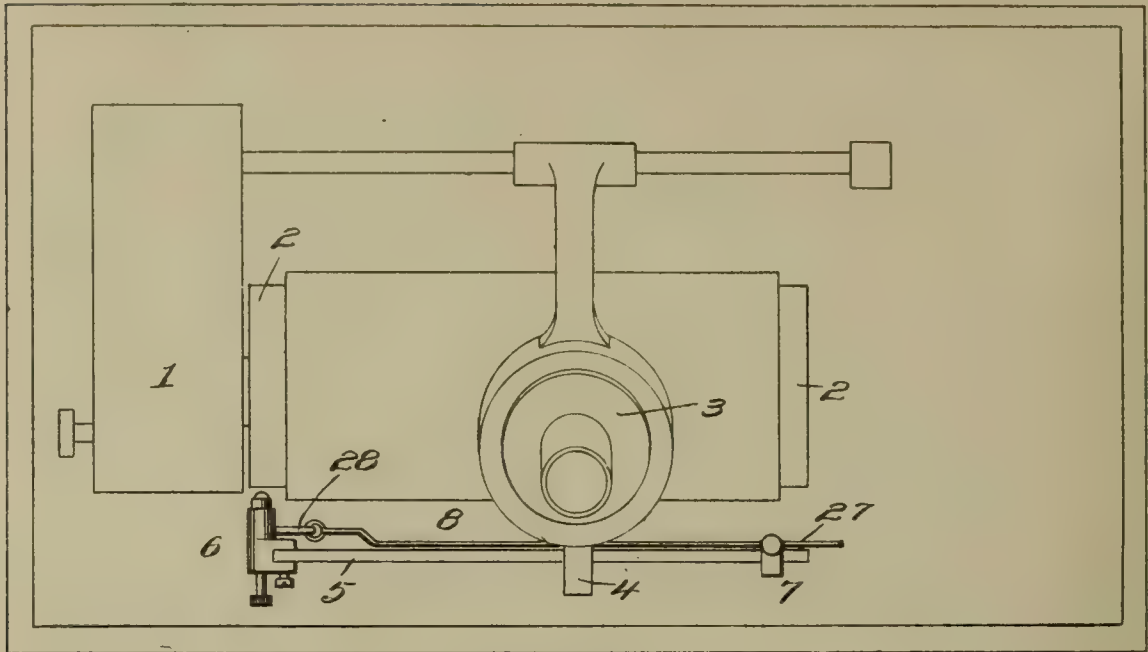


Fig. 1.

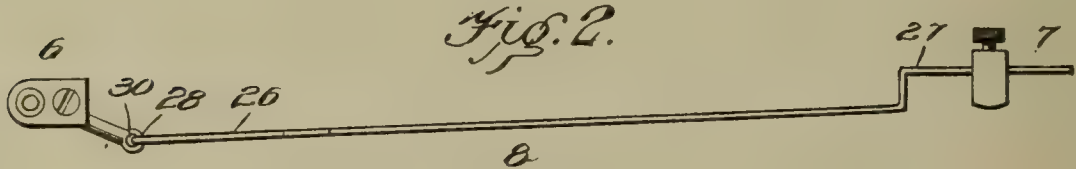


Fig. 2.

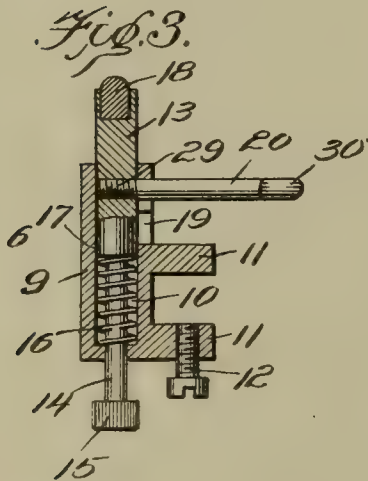


Fig. 3.

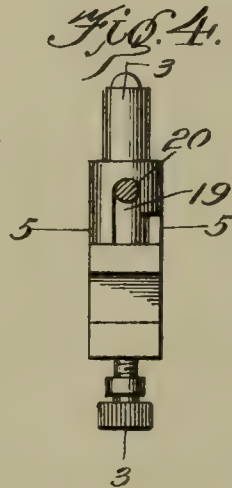


Fig. 4.

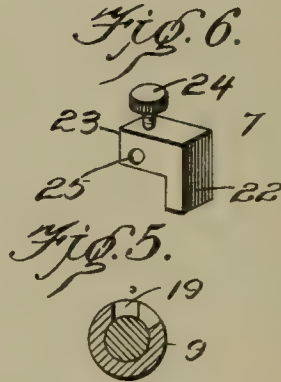


Fig. 6.

Fig. 5.

Witnesses

Geo. A. Schenck Jr.
Harry M. Test.

Inventors
John D. Bowers
Leon Mayhue.

By *Victor J. Evans*
Attorney

UNITED STATES PATENT OFFICE.

JOHN D. BOWERS AND LEON MAYHUE, OF SALT LAKE CITY, UTAH.

PHONOGRAPH.

968,530.

Specification of Letters Patent.

Patented Aug. 30, 1910.

Application filed November 10, 1909. Serial No. 527,240.

To all whom it may concern:

Be it known that we, JOHN D. BOWERS and LEON MAYHUE, citizens of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented new and useful Improvements in Phonographs, of which the following is a specification.

The present invention relates to phonographs, and particularly to attachments for automatically stopping the machine when the record has been played.

One object is to provide a device of this character which is simple and effective in operation.

Another object is to provide such a device which is adapted to be readily attached to the present form of machine.

These and other objects may be attained by the construction shown in the accompanying drawings in which:

Figure 1 is a plan view of a phonograph machine showing our invention applied, Fig. 2 is a view of the invention detached from the machine, Fig. 3 is a vertical sectional view of Fig. 4, on the line 3—3, Fig. 4 is an elevation of the braking device, Fig. 5 is a sectional view on the line 5—5 of Fig. 4, and Fig. 6 is a detail view of the trip detached.

In the drawings 1 represents the motor of a phonograph machine, 2 the record carrying drum, 3 the sound box having the lug 4, and the rider bar 5.

The invention herein contemplated is adapted for attachment to the rider bar 5.

The present device comprises the brake member 6, the trip member 7, and the connecting link 8.

The brake member consists of the cylindrical portion 9 having a longitudinal bore 10 formed therein. Laterally projecting spaced fingers 11 on the portion 9, one of which carries the adjusting screw 12, serve as a clamp by means of which the member 6 is secured to one end of the rider bar 5. Sliding in the bore 10 is a plunger 13. The lower portion 14 of the plunger is reduced and protrudes through the bottom of the member 6, and has its extremity provided with a milled head 15, adapted to be grasped by the fingers of the hand to adjust the plunger 13. A coiled spring 16 is seated between the shoulder 17 of the plunger and the bottom of the bore and encircles the reduced end 14 thereof. The spring keeps the

plunger 13 at its upward limit of movement. Seated in a recess in the upper end of the plunger 13 is a friction block 18 of rubber, leather or other suitable material. A bayonet slot 19 is formed in the side of the portion 9 and directly above the upper of the clamp fingers 11. An eye bolt 20 secured in any suitable manner as by a threaded end 29 to the plunger 13, lies in the bayonet slot 19.

The trip member consists of the block 7 having the depending portion 22 and horizontal portion 23. The portion 23 is vertically perforated to receive the adjusting screw 24, and transversely perforated as at 25 to receive the end 27 of the connecting link 8.

The connecting link 8, is bent near each end transversely and forwardly at an angle so that its ends 26 and 27 lie in a plane parallel with the main portion thereof. The end 26 is provided with an eye 28 adapted to engage in the eye 30 of the bolt 20, and form a loose connection.

The operation of the device is as follows: The brake member 6 is secured to one end of the rider bar 5 by means of clamping fingers 11 and screw 12. The block 7 is placed on the opposite end of the rider bar 5 so that its horizontal portion 22 rests on the bar, and the portion 23 lies against the outer face of the bar. The link 8 is inserted in the perforation 25 and adjusted so that the block 7 is positioned the proper distance from the opposite end of the rider bar 5, to be engaged by the lug 4 on the sound box 3. The plunger 13 is pulled back by means of the head 15 and turned until the bolt 20 engages in the transverse portion of the bayonet slot 19. The phonograph is started, and when the sound box 3 reaches the end of the record the lug 4 will engage the trip block 7 and move it along the rider bar, thereby communicating motion through the link 8 to the bolt 20. The bolt 20 will be moved in the slot 19 until it comes opposite the longitudinal portion thereof. The spring 16 will then act on the plunger 13 and force it outward bringing the friction block 18 against the record drum 2, which will stop the machine. The trip 7 may be adjusted longitudinally accordingly as the records are longer or shorter.

It will thus be seen that a very simple and effective device is produced, and one which will not easily get out of repair. Further a

device is produced which can be readily attached to the rider bar of a phonograph without any alterations in the form or construction of the machines on the market.

5 Having thus described the invention what is claimed as new is:

10 1. The combination with a phonograph having a rider bar, of a brake member secured at one end of said rider bar and including a trigger, a link loosely connected at one end to the trigger, and a trip block longitudinally adjustable on the link near its opposite end and loosely riding on the rider bar.

15 2. The combination with a phonograph having a rider bar, of an automatic stop comprising a brake member having a hollow body provided with a bayonet slot, a spring pressed plunger playing in the hollow body and having a friction block on its
20 outer end, a laterally projecting apertured

lug on the said plunger and riding in said bayonet slot, laterally projecting parallel arms on the hollow body adjacent one end of the bayonet slot adapted to straddle the rider bar of a phonograph, one of the arms carrying a binding screw whereby the brake member is clamped to the rider bar near one end thereof, an L-shaped trip member loosely engaging the rider bar near its opposite end and provided with an aperture and clamping screw, and a link adjustable in the aperture of the trip member and having its opposite end engaging in the aperture of the said lug on the spring pressed plunger. 25 30 35

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN D. BOWERS.
LEON MAYHUE.

Witnesses:

R. T. HARBACH,
J. FLETCHER, Jr.

C. L. CHISHOLM.
 MEANS FOR REPRODUCING SOUNDS FROM SOUND RECORDS.
 APPLICATION FILED FEB. 13, 1909.

968,539.

Patented Aug. 30, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

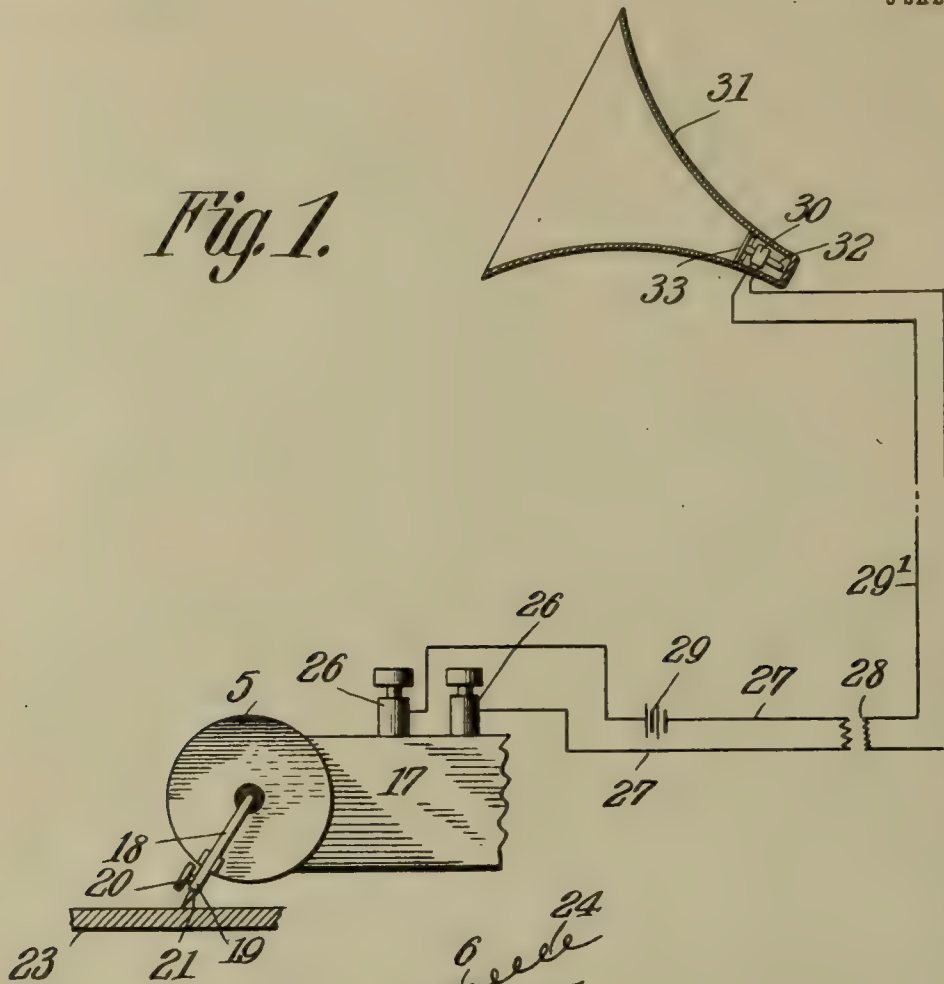
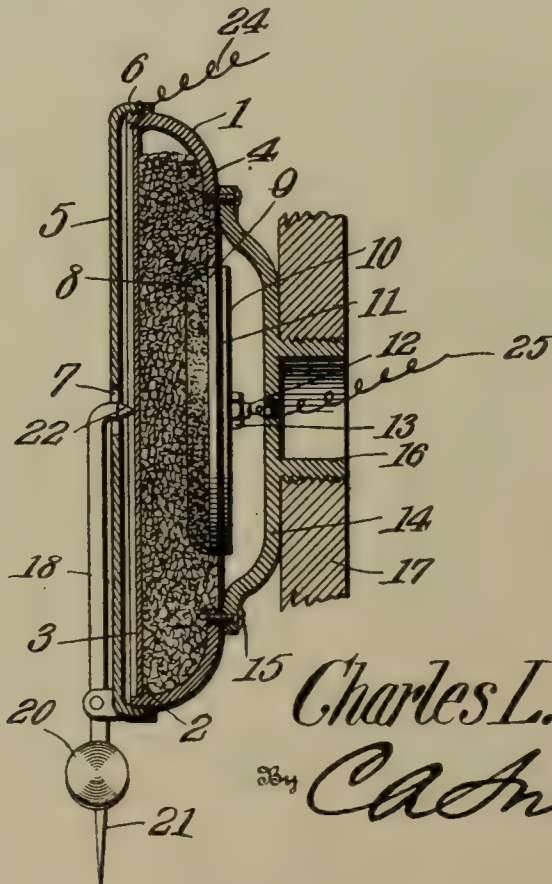


Fig. 2.



Witnesses
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Inventor,
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 By *CA Snow & Co.*
 Attorneys

C. L. CHISHOLM.
 MEANS FOR REPRODUCING SOUNDS FROM SOUND RECORDS.
 APPLICATION FILED FEB. 13, 1909.

968,539.

Patented Aug. 30, 1910.

3 SHEETS—SHEET 2.

Fig. 3.

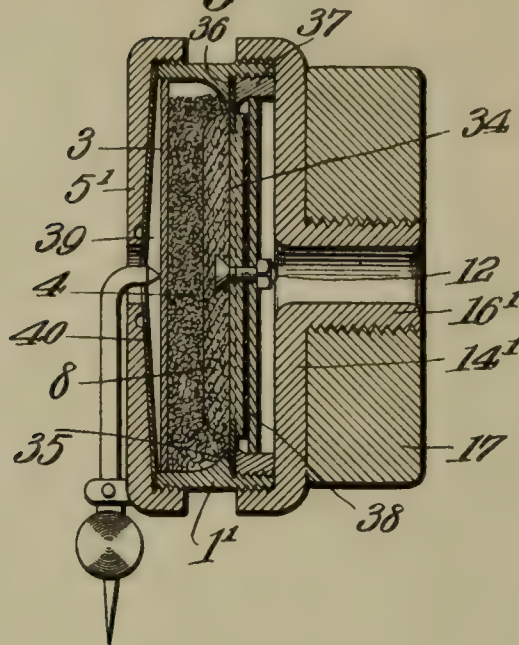
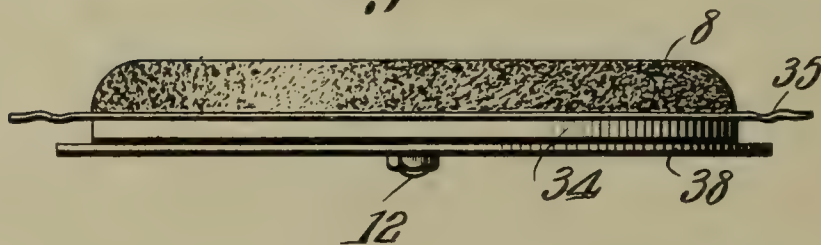


Fig. 4.



Charles L. Chisholm

Inventor.

Witnesses

E. J. Stewart
F. T. Chapman

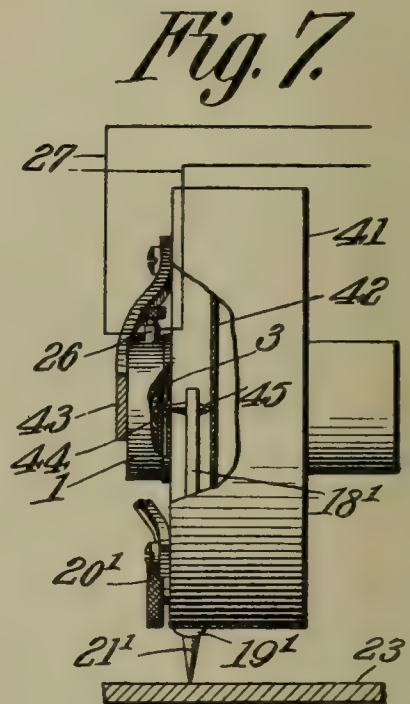
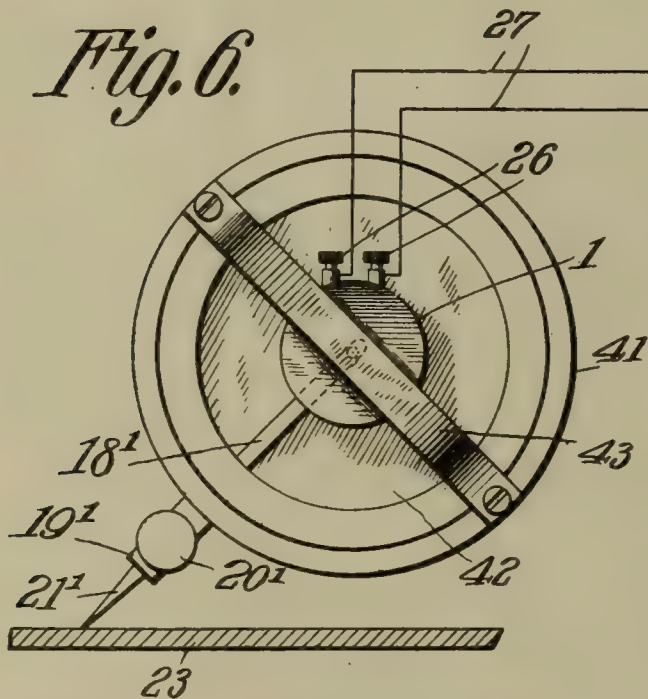
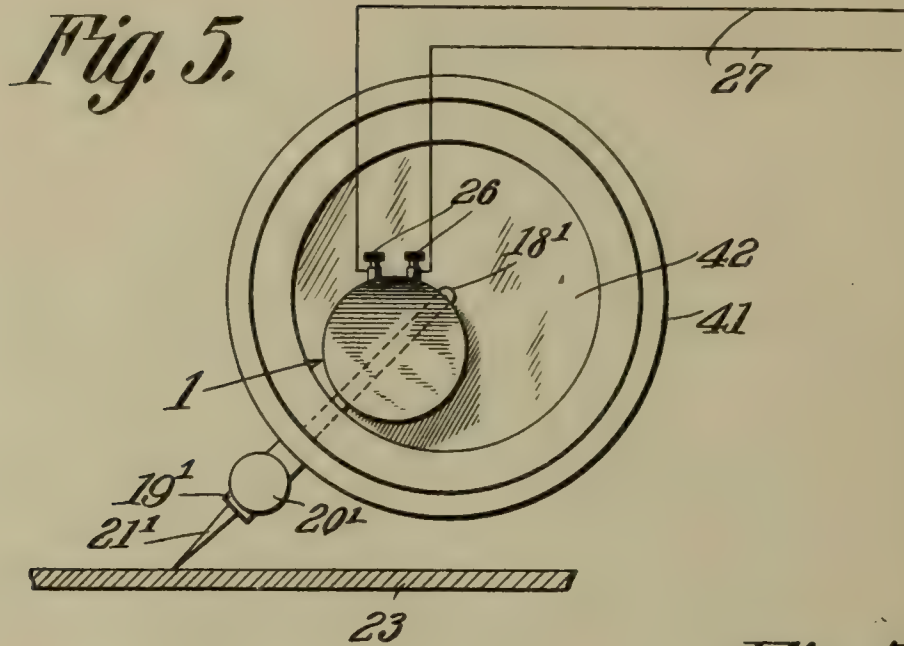
By *CA Snow & Co.,*
 Attorneys.

C. L. CHISHOLM.
 MEANS FOR REPRODUCING SOUNDS FROM SOUND RECORDS.
 APPLICATION FILED FEB. 13, 1909.

968,539.

Patented Aug. 30, 1910.

3 SHEETS—SHEET 3.



Witnesses

E. J. Stewart
F. J. Chapman

Inventor
Charles L. Chisholm
 By *C. A. Snow & Co.*
 Attorneys

UNITED STATES PATENT OFFICE.

CHARLES L. CHISHOLM, OF MARYSVILLE, NEW BRUNSWICK, CANADA.

MEANS FOR REPRODUCING SOUNDS FROM SOUND-RECORDS.

968,539.

Specification of Letters Patent.

Patented Aug. 30, 1910.

Application filed February 13, 1909. Serial No. 477,799.

To all whom it may concern:

Be it known that I, CHARLES L. CHISHOLM, a subject of the King of England, residing at Marysville, in the Province of New Brunswick, Canada, have invented a new and useful Means for Reproducing Sounds from Sound-Records, of which the following is a specification.

This invention has reference to improvements in means for reproducing sounds from sound records and its object is to provide a means whereby higher and more delicate overtones upon which that quality of the sound known as the timbre so largely depends, are reproduced.

The grosser sound waves represent forces of comparatively considerable magnitude and so are able to overcome without serious effect on themselves opposing forces of commensurate magnitude. The actual power of such sound waves is of course quite small or minute, but the overtones are so small that highly attenuated opposing forces may actually become great when compared with the forces developed by some of the overtones. Still it is upon such overtones that the quality of the voice or sound which is termed timbre depends and it is upon this timbre that one is enabled to individualize and recognize voices and other sounds. The utilization of these extremely minute forces is vital to the present invention which aims to the elimination of certain conditions which have been found to be detrimental to the proper reproduction of sounds.

In accordance with the present invention the ordinary sound box of the sound reproducing machine is replaced by or carries a microphonic element, which as will hereinafter appear is specially constructed and by which it is possible to transmit the sounds to an indefinite distance in the form of electrical undulations corresponding to the sound waves and at a distant point convert these undulations into air waves which will correspond to and reproduce the original sounds not only as to volume and general quality but by saving the overtones usually lost in sound reproduction the purity and recognizability of the sounds is greatly enhanced.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawings, forming a part of this specification, in which drawings,

Figure 1 is a diagrammatic representation of the application of the invention to a sound reproducing machine for distant reproduction. Fig. 2 is a central section through one form of microphonic element with the stylus carrier applied thereto. Fig. 3 is a central section through another form of microphonic element with the stylus carrier applied thereto. Fig. 4 is an elevation of the back contact of the microphonic element and parts carrying the contact. Fig. 5 is a view of the ordinary type of sound box of a sound reproducing machine with the microphonic element applied to the stylus carrying arm or lever. Fig. 6 is a similar view showing a somewhat different arrangement than shown in Fig. 5. Fig. 7 is a side elevation, partly in section, of the structure shown in Fig. 6.

Referring to the drawings, there is shown in Fig. 2 a casing 1 for the microphonic element and this casing has rounded walls in the direction of the axis thereof, and is generally cylindrical or annular in shape while it is to be understood that the inner wall of this casing is highly polished. The wider end of the casing is provided with an inwardly directed annular flange or ledge 2 for the reception of a diaphragm 3 which latter is preferably made of carbon or metal and against which engage granules 4, preferably though not necessarily of carbon.

It is of importance in the practical embodiment of this invention that the diaphragm be secured to the casing without stresses or strains of any kind, either local or general. Still the diaphragm should be rigidly held in place and be evenly sensitive over its entire area. It is found to be impossible with the ordinary screw cap to get a perfectly even pressure around the periphery of the diaphragm since there will always be more or less unequal stress or tension of the adjacent parts of the surface of the diaphragm nearest the periphery so that there are lines or zones in the surface of the diaphragm which do not respond with equal sensitiveness to the rest of the surface of the diaphragm and consequently the diaphragm may offer very great resistance, comparatively, to the next extremely delicate overtones so that the action of these overtones upon the diaphragm will become entirely lost and no electric currents will be developed corresponding to such overtones consequently the voice at the receiving end of the

line will have an entirely different quality from that of the speaker at the transmitting end of the line, or the quality or timbre of other sounds will be likewise changed, because of the obliteration of the overtones.

In order to properly seat the diaphragm the ledge 2 is made as narrow as is practically possible and the diaphragm is cemented thereto by some hard firm cement, and this cementing is performed without putting the diaphragm under strain or stress and more especially uneven strains or stresses such as are liable to occur when the diaphragm is clamped in place. The diaphragm is thus peripherally supported without local or general transverse buckling or strain. The inner face of the diaphragm is highly polished.

The outer edge of the casing 1 may be screw-threaded and to this screw-threaded portion is applied a cover plate 5 having an annular flange 6 at its periphery internally threaded to receive the outer surface portion of the casing 1 and the plate 5 has a central perforation.

There is provided a back contact 8 in the form of a circular block of carbon with rounded peripheral edges with the face and edges highly polished. The back contact block 8 may be made fast in any suitable manner to a metal block 9 of brass or other suitable material and between this block 9 and a plate 10 is secured a mica or other suitable insulating plate 11 which is clamped between the block 9 and plate 10 by means of a clamp screw 12 and nut 13 applied thereto. The plate 11 is of such diameter as to extend to and slightly beyond the back edges of the casing 1 and is secured to the casing by a back cap 14 and suitable screws 15. The back cap 14 is provided with a central sleeve 16 which may be externally threaded and screwed into a suitable opening in an arm 17 which latter may correspond to the swinging arm of certain types of sound reproducing machines.

Secured to the plate 5 in the form of instrument shown in Fig. 1, is a stylus carrying lever 18 provided at the outer end with a socket 19 and clamp screw 20 for holding a stylus 21 in place as is customary in the gramophone type of sound reproducing machines. The other end of the stylus carrier 18 is bent toward the diaphragm 3 and projects through the opening 7 and terminates in a point 22, this point bearing against the diaphragm with the smallest practical area of contact. Theoretically this area of contact should be a mathematical point, but since this is obviously impossible the contact is made as small as practicable. The stylus 21 is assumed to engage the sound record groove of a sound record the latter being indicated at 23.

The circuit connections from the micro-

phonic element are diagrammatically represented in Fig. 2 by the conductors 24 and 25, one being connected to the diaphragm 3 either directly or through the casing 1 and the other to the back contact 8 through the stud or screw 12. These conductors are carried to binding posts 26 on the arm 17 and the local microphone circuit is connected to the binding posts being represented by the conductors 27 leading to the primary winding of an induction coil 28 and including a battery 29 or other suitable source of electric current. The secondary winding of the coil 28 is coupled up to line wires 29' which may be extended to any desired distance, and be there connected to a receiver coil 30 housed in one end of an amplifying horn 31 if it be desired to increase the reproduced sound and to make it audible to a number of persons or over a large space. The receiver coil is placed about a receiver magnet 32 as is usual while the diaphragm 33 is mounted similar to the mounting of the diaphragm 3, that is without stress or strain, other than what it receives from the receiver magnet 32. All the surfaces with which the carbon granules of the microphonic element come in contact are highly polished thus correspondingly reducing the frictional contact between the surfaces with which the granules are in engagement. There is therefore less resistance of a mechanical nature to the movements of the carbon granules than is the case where they come in contact with rough surfaces.

It has been found from many tests that when the inner surface of the diaphragm and the surface of the back contact and the inner surface of the casing are highly polished the overtones are transmitted to the line to such an extent as to sensibly increase the richness of reproduction and the naturalness of the tones reproduced. It is also found that by making the receptacle for carbon granules co-extensive with the diaphragm there is a marked improvement in the transmission of the sound including the overtones.

In Figs. 3 and 4 there is shown a structure which is preferable to that shown in Fig. 2 so far as the reproducer or transmitter is concerned, while the circuit connections will be the same as shown in Fig. 1. In the structure shown in Fig. 3 there is a cylindrical box or casing 1' having the inner walls curved in the direction of the longitudinal axis of the box the same as in the structure shown in Fig. 2. The diaphragm 3 is the same as described with reference to the structure of Fig. 2 and is co-extensive with the chamber formed by the inner wall of the box or casing 1'. In this form the supporting ledge has no area and therefore corresponds to the theoretical condition.

The diaphragm is secured to the inner wall of the box 1' without stress or strains by having its periphery cemented directly to the walls of the box preferably by a metallic cement such as solder. In the case of a metal diaphragm which is preferably made of silver with the inner face gold plated, the soldering is easily accomplished. In the case of a carbon diaphragm the periphery may be electro-plated and then the diaphragm is readily soldered to the inner wall of the casing 1', which casing it will be understood is made of metal. The diaphragm may thus be secured firmly in place without stress or strain and will vibrate as a whole with the greatest freedom to the forces caused by the impact of the sound waves on the receiving side of the diaphragm. The back contact 8 is the same as in Fig. 2 but the manner of supporting the same is different. Secured to the back contact 8 is a plate 34 and clamped around the edges of the back contact where joined by the plate 34 is an annular membrane 35 of gold beater's skin or of delicate silk or of some other like highly flexible material. This annular member 35 is secured at its outer edge to the casing 1', against a shoulder 36 formed by thickening the casing at this point and is there held by a clamp ring 37 screwed into a suitably threaded portion of the casing 1' at the end remote from that carrying the diaphragm 3.

There is formed within the casing 1' a chamber for the granules 4 which, as before stated, are preferably though not necessarily made of carbon, and this chamber is defined on one side by the diaphragm 3, on the other side by the back contact 8 and the annular membrane or flexible wall 35 while the curved wall of the casing 1' completes the chamber. The inner walls of the casing 1' may be metallic or of insulating material, but in either event these walls as well as the inner surface of the diaphragm and the exposed surface of the back contact 8 must be highly polished.

Secured to the face of the plate 34 remote from the back contact 8 is another diaphragm 38. This diaphragm may be made of metal or mica, but if made of metal should be suitably insulated from the casing 1'. The diaphragm 38 is secured to the inner face of the sleeve 37 in the same manner as is secured the diaphragm 3 to the inner wall of the casing 1', that is it should be secured to the sleeve 37 without being under stress or strain due to the manner of securing it. In the case of a mica or similar insulating diaphragm a very narrow ledge such as the ledge 2 of the structure shown in Fig. 2 may be employed, and in the case of a metal diaphragm then the periphery of the diaphragm may be soldered or otherwise cemented directly to the wall of the

sleeve 37, in which latter case, considering the sleeve 37 to be of metal, the diaphragm 38 must be insulated from the plate 34 if the latter be made of metal, and be in conducting contact with the back contact 8. 70

The diaphragm 38 should be somewhat more responsive to the sound impulses than is the diaphragm 3 but in each case the diaphragm 3 and diaphragm 38 are of such size and thickness that their fundamental tones or rates of vibration are higher than the rates of vibration of the normal human voice. Since the actual diameter of these diaphragms is only about three-quarters of an inch, this diameter having been found to operate successfully in practice, the thickness of the diaphragms will be chosen accordingly to attain the high fundamental tone desired. It is to be understood however that while the diaphragms are to be small as compared to the diaphragms used with the commercial types of sound reproducing machines, the particular dimension given is not to be taken as the only diameter which may be used but some variation on each side of the stated diameter is permissible, other parts being adjusted accordingly. 85 90

The diaphragm 3 is protected by a cover 5' between the inner face of which and the outer face of the diaphragm there is a small air chamber 39 which air chamber is made non-resonant by its minute size and also by lining the interior of the cap 5' with some non-resonant material such as felt or cloth and which material is indicated in the drawings at 40. Other means for rendering the chamber 39 non-resonant may be employed. 95 100

The microphonic reproducer of Fig. 3 is provided with a back cap 14' having a neck 16' which may be threaded to enter a corresponding passage in the arm 17, or any other suitable means for attaching the reproducer to the arm 17 or to any other suitable carrier by means of which the reproducer is caused to properly engage a sound record may be employed. 105 110

It is evident that sound records as found on the market contain recorded sounds which the reproducing sound boxes usually employed are incapable of transmitting to the air. These usually unreproducible sound waves are apparently the higher overtones since by using the microphonic unit of this invention I am enabled to get a reproduction from sound records markedly excelling in richness any reproduction of which the usual sound reproducing devices are capable. 115 120

While the reproducing sound box or microphonic unit embodying the present invention is indicated as of the type used with disk records of the gramophone sound reproducing machines, it will be understood that it may be used with the graphophone type of sound records with a suitable change in the stylus carrier and stylus. Consequently the 125 130

showing of the drawings is to be taken as indicative only so far as the type of sound reproducing machine is concerned.

Actual tests made with a practical embodiment of the invention show that the resultant reproduction is clear, sharp and brilliant, and the reproduction of the timbre of the original sound is very marked.

In Figs. 5, 6 and 7 there is shown a sound box 41 such as is used on sound reproducing machines of the gramophone type, the stylus carrier being shown at 18', the stylus socket at 19', the clamp screw at 20', and the stylus at 21'. The microphonic unit of Figs. 2 or 3 is designated generally by the reference numeral 1. In the form shown in Fig. 5, the microphonic unit is mounted directly upon the stylus arm or lever 18' and participates in its movements under the action of the sound record groove in the tablet 23, transmitted to the stylus arm 18' through the stylus 21' in the usual manner. The microphonic unit 1 is made fast to the stylus carrier 18' in any suitable manner, and while it may dampen the action of the stylus carrier and through it, the action of the diaphragm 42 of the sound box 41, this damping will not be material or excessive. In Figs. 5 and 6 the sound box 41 carries a bridge piece 43 spanning the sound-box frame diametrically, and spaced from the diaphragm 42. This bridge piece 43 carries the microphonic unit 1 in operative relation to the stylus carrier 18', the latter being provided with a pin or stud 44, engaging the microphone diaphragm 3 at, or near the center and is there pointed to provide a contact of the least practical area which contact is not connected to the diaphragm 3 but simply bears thereagainst. The best results in the sound box 41 are obtained when the stylus arm 18' is provided with a pointed contact 45 bearing against the center of the diaphragm 42 with a bearing area of inconsiderable extent and without positive connection between the diaphragm 42 and the contact 45. This, however, does not preclude the use of the invention in connection with sound boxes wherein the stylus carrier is fixed to the diaphragm.

By means of the structures shown in Figs. 5, 6 and 7 the sound record is reproduced both locally and distantly.

What is claimed is:—

1. A means for reproducing sound from sound records, comprising a microphonic unit having a diaphragm with a fundamental higher than the rate of vibration of the normal human voice, a stylus carrier in contact with but unconnected to the center of the diaphragm of the microphone, and a telephonic reproducer in electrical connection with the microphone.

2. A reproducer for sound reproducing machines comprising a sound box provided with a diaphragm and a stylus carrier in operative relation to the diaphragm, and a microphonic unit having a diaphragm also in operative relation to the stylus carrier.

3. A reproducer for sound reproducing machines comprising a sound box provided with a diaphragm and a stylus carrier in operative relation to the diaphragm, and a microphonic unit having a diaphragm also in operative relation to the stylus carrier, the microphone diaphragm having a higher fundamental rate of vibration than that of the sound box diaphragm.

4. A reproducer for sound reproducing machines comprising a sound box provided with a diaphragm and a stylus carrier in operative relation to the diaphragm, and a microphonic unit having a diaphragm also in operative relation to the stylus carrier, the microphone diaphragm having a fundamental rate of vibration higher than that of the normal human voice.

5. A reproducer for reproducing machines comprising a microphonic unit and a stylus carrier in operative relation thereto, the microphonic unit having a diaphragm the fundamental of which is higher than the normal rate of vibration of the human voice.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

CHARLES L. CHISHOLM.

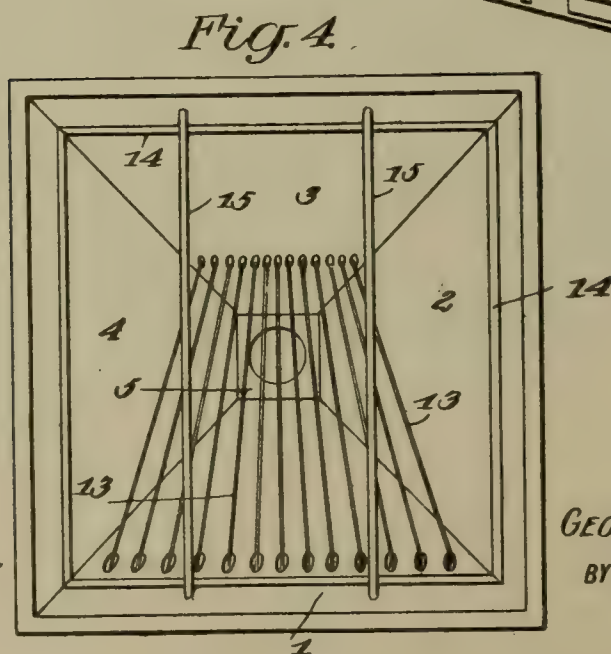
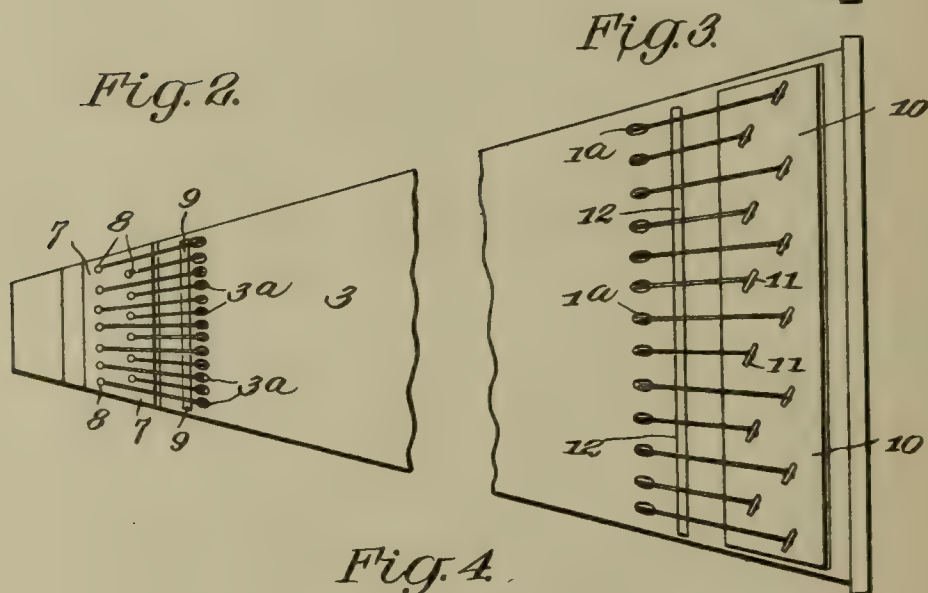
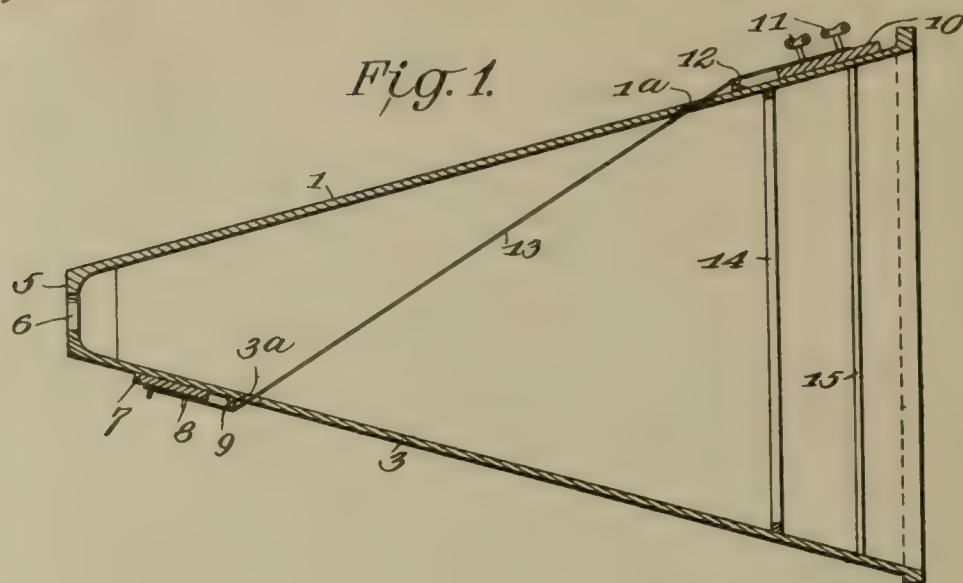
Witnesses:

LOUIS MASON,
JOHN W. G. MORRISON.

G. H. WHITE.
MUSICAL HORN.
APPLICATION FILED MAR. 14, 1910.

969,126.

Patented Aug. 30, 1910.



WITNESSES:
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INVENTOR
GEORGE H. WHITE
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ATTORNEYS

UNITED STATES PATENT OFFICE.

GEORGE H. WHITE, OF CHICAGO, ILLINOIS.

MUSICAL HORN.

969,126.

Specification of Letters Patent.

Patented Aug. 30, 1910.

Application filed March 14, 1910. Serial No. 549,200.

To all whom it may concern:

Be it known that I, GEORGE H. WHITE, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have made certain new and useful Improvements in Musical Horns, of which the following is a specification.

My invention relates to improvements in horns for the use on phonographs, megaphones and the like, and it consists in the combinations, constructions and arrangements herein described and claimed.

The main object of my invention is to provide a device in which the original sounds are amplified by means of vibrating strings, which are carried within the horn, and which take up the vibrations of the original sounds, thus producing a clearer and stronger tone.

A further object of my invention is to provide means for regulating the pitch of the various strings, so as to selectively amplify any of the sounds coming from the original source.

A further object of my invention is to provide means for breaking up the echoes that are objectionable in the ordinary horn, thereby eliminating conflicting sound waves which tend to impair the efficiency of the device.

Other objects and advantages will appear in the following specification and the novel features of the device will be particularly pointed out in the appended claim.

My invention is illustrated in the accompanying drawings forming part of this specification in which—

Figure 1 is a longitudinal section through the device. Fig. 2 is a view of a portion of the under side of the device shown in Fig. 1. Fig. 3 is a plan view of a portion of the device shown in Fig. 1, and Fig. 4 is a front view looking into the larger end of the horn.

In carrying out my invention I provide a horn of any suitable shape, such as that used for phonographs or megaphones. In the present instance I have illustrated a device having four plain sides, but it will be understood, of course, that the principle might be applied to a horn of any shape.

In the drawings I have shown a horn comprising the four converging sides 1, 2, 3 and 4 secured together by means of the end piece 5. The latter is provided with a sound opening 6 and this end of the horn is adapted to fit into the holder in the manner of the ordinary phonograph horn. On one side of the horn toward the smaller end thereof, I provide a tail-piece 7 which is provided with pins 8. A short distance from the tail-piece is a bridge 9. On the opposite side toward the larger end of the horn is a key-block 10 provided with keys 11. A bridge 12 is located a short distance from the end of the key block. In the side 3 are openings 3^a and in the side 1 are openings 1^a. These openings are for the strings 13 which are secured to the posts 8 and bear on the bridges 9 and 12 and are wound around the stems of the keys 11. On the inside of the larger end of the horn I arrange the strips 14 which serve as echo breaks, while adjacent these are sounding posts 15.

From the foregoing description of the various parts of the device the operation thereof may be readily understood.

With the horn attached to a phonograph, the sounds coming from the sound-reproducer enter the opening 6 and pass the strings 13. These strings then take up the vibrations and amplify them. The strings may be tuned by means of the keys 11 so as to reinforce any particular tone. The echoes are broken up, and the result is that with a plurality of strings, the tones are reinforced to such an extent as to render the sound given out clearer and stronger than with the ordinary form of horn.

I am aware that other forms of the device based upon the same general idea might be made, but I consider as my own all such modifications as fairly fall within the spirit and scope of the invention.

I claim:

A horn for phonographs, megaphones and the like, comprising a hollow tapering member open at its larger end, and provided at its smaller end with a sound opening, and having perforations on opposite sides, a tail piece having pins, said tail piece being secured to one side of the tapering member

near the sound opening, a key block provided with keys secured on the opposite side of said tapering member near said open end, and a series of strings having their ends attached to the pins of said tail piece and their opposite ends secured to the keys in said key block, said strings passing through the interior of said hollow tapering member from one side to the other and being spaced apart to intercept sound waves.

GEORGE H. WHITE.

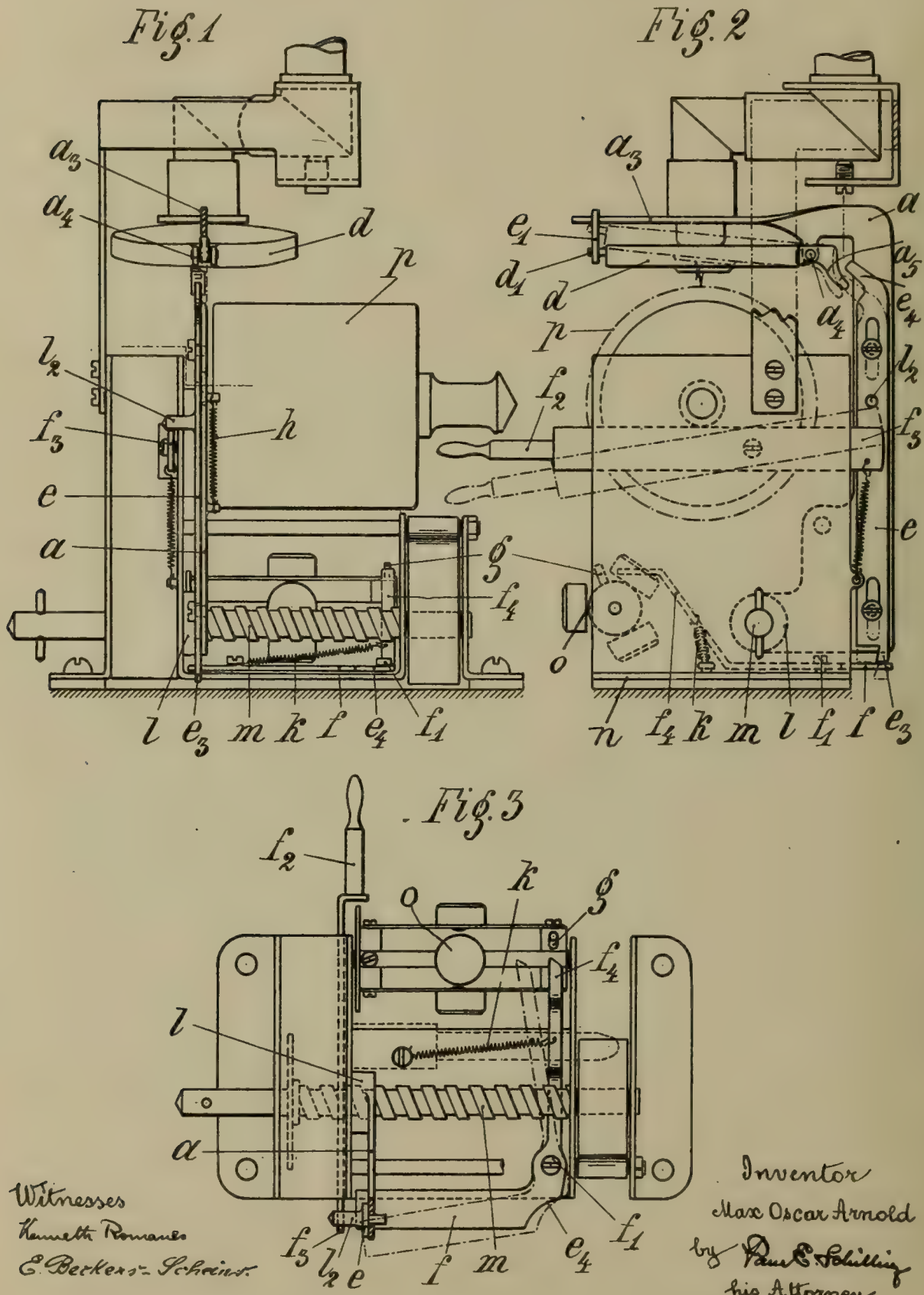
Witnesses:

FRANK M. PRAY,
EDWIN PRAY.

M. O. ARNOLD.
TALKING MACHINE.
APPLICATION FILED NOV. 4, 1909.

969,239.

Patented Sept. 6, 1910.



UNITED STATES PATENT OFFICE.

MAX OSCAR ARNOLD, OF NEUSTADT, NEAR COBURG, GERMANY.

TALKING-MACHINE.

969,239.

Specification of Letters Patent.

Patented Sept. 6, 1910.

Application filed November 4, 1909. Serial No. 526,319.

To all whom it may concern:

Be it known that I, MAX OSCAR ARNOLD, a subject of the German Emperor, and residing at Neustadt, near Coburg, Germany, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

The present invention has reference to improvements in talking machines, and relates more especially to that class of talking machines, known as phonographs, in which the recorder and reproducer travel longitudinally of the revolving cylindrical record, and my invention more particularly has for its object certain improvements in this type of machine, which render it readily adaptable to be arranged within a relatively small space, as for instance within the body of a doll or the like. The construction is simple, of small dimensions, light of weight, yet strong and not liable to become disordered or broken. The reproducer is limited in its lateral displacements, so that onesided overbalancing of the containing body is obviated, which in the constructions now in use is apt to cause toppling over of the doll, upon the recorder reaching one of its end positions. And lastly, I provide means whereby the main spring cannot wholly run down or be over-wound, so that the reproducer travels with a constant velocity, thereby assuring correct and even reproduction of the phonogram.

In order to make the invention more readily understood, I will now describe it with reference to the accompanying sheet of drawings, in which—

Figure 1 represents a rear view of a machine embodying the essential parts of my invention; Fig. 2 shows a side elevation, and Fig. 3 a horizontal section, just above the driving spindle.

The reproducer box d travels horizontally above and longitudinally along the cylinder record p , which is rotated in well known manner by a clock work, not specially shown in the drawing. The reproducer is pivoted to the angle piece or carrier a , a^3 , which by means of the threaded sleeve l on its lower extremity is traveled along the correspondingly threaded spindle m . This latter, at the same time, is used for winding up the main spring of the clock work. The reproducer is pivoted at a^4 to the arm a^3 of the angle and its up and down movement is limited by a pin d^1 cooperating with a guide

yoke e^1 depending from the arm a^3 . On the arm a the slotted slide e is vertically displaceable and influenced by a draw spring h (Fig. 1), the slide ordinarily with its upper curved-out end e^4 depressing the shorter lever arm a^5 of the reproducer and supporting it in the position shown in dotted lines in Fig. 2, slightly above the record.

On the bottom plate n there is pivoted at f^1 a bell crank lever f , f^4 which ordinarily is retained in the dotted line position (Fig. 3) by means of a spring k . A recess e^4 serves to receive the beveled tooth e^3 of the slide e upon the work having run down. In this position the arm f^4 of the bell crank lever lies sidewise of a pin g secured to the horizontally disposed regulator o . If now the clock work is wound up by turning the screw spindle m , which causes the reproducer d with its carrier a and slide e to travel from the right-hand toward the left-hand end position, the tooth e^3 of slide e swings the lever f inwardly, bringing its arm f^4 in the plane of rotation of the regulator stop pin g , with the effect of arresting the regulator and consequently the whole clock work during the winding-up operation. Upon the reproducer and slide e arriving at the left side, a pin l^2 of the slide extends just above a double-armed, spring influenced starting lever f^2 , f^3 .

If now, for starting the mechanism, the lever end f^2 is depressed, its inner end f^3 will lift the pin l^2 , raising accordingly the slide e above the bell crank lever f (Fig. 2). The reproducer is let down onto the record, lever f is swung into the dotted line position (Fig. 3) by spring k , its arm f^4 freeing the regulator, and the slide e rests with its tooth e^3 upon the lever f . The work running down, the tooth e^3 slides along the lever until, upon the reproducer having reached its end position, it drops into the cut-out portion e^4 by the action of the draw spring h , lifting thereby the reproducer off the record. The recess e^4 and the tooth e^3 are so profiled, that the slide e slips off only at the end of the reproduction.

With the exception of part of the spindle m and the free end of the starting lever, all parts in this construction are so crowded and their weight distribution is such, that the apparatus is especially adapted to be inserted into dolls, imitation animals, and the like. The frame plates limiting the lateral displacement of the threaded sleeve

on the spindle, overwinding or complete running down of the main spring is effectively prevented.

What I claim and desire to secure by Letters Patent is:—

10 In a talking machine with cylindrical record, a bell crank lever, a clock work, a regulator thereon, a stop pin on said regulator, periodically coöperating with said bell crank lever, an angular carrier, a reproducer pivoted thereto, a spring influenced slide on said carrier, coöperating above with said reproducer and below with said bell crank lever, the latter serving to alternately hold

said slide in the raised and lowered position 15 respectively, means for raising said slide, and means for traveling said carrier from one end position into the other with raised reproducer and back again with the reproducer in contact with the record, substantially as and for the purpose set forth. 20

In testimony whereof I affix my signature in presence of two witnesses.

MAX OSCAR ARNOLD.

Witnesses:

O. FLINZE,

C. WAGNER.

E. G. H. STEIN.
 PHONOGRAPH, GRAPHOPHONE, AND LIKE INSTRUMENT.
 APPLICATION FILED JAN. 6, 1910.

969,917.

Patented Sept. 13, 1910.

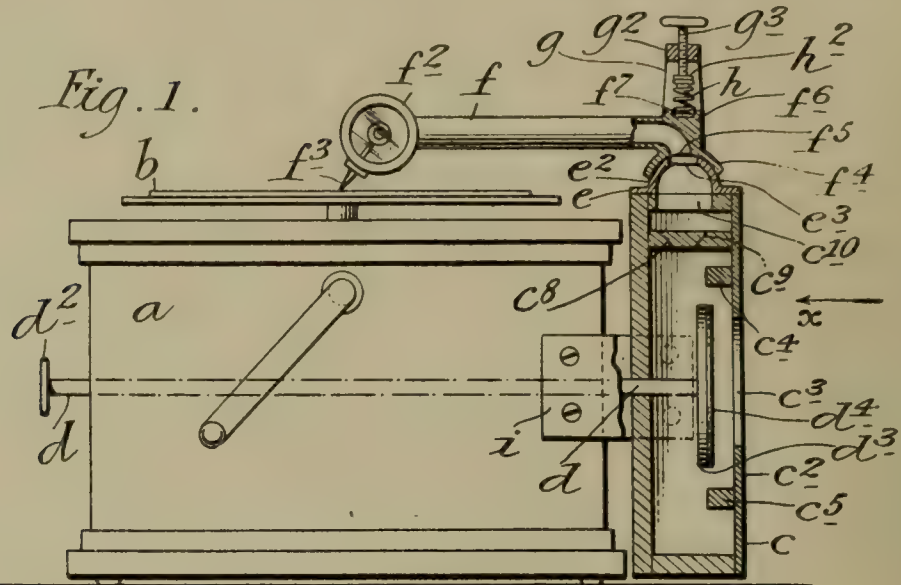


Fig. 2.

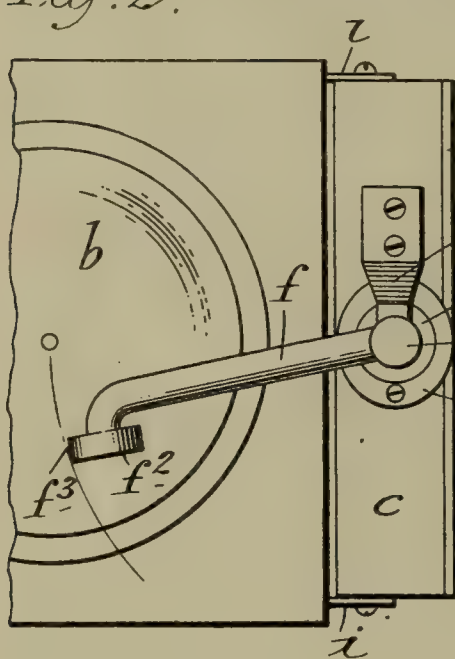
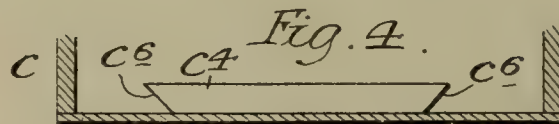
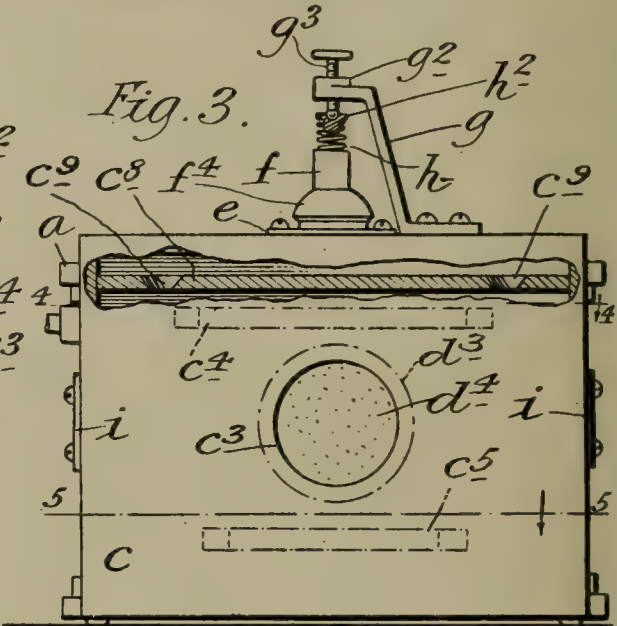


Fig. 3.



WITNESSES:

A. R. Appleman
L. E. Nutreany

INVENTOR.

Emil G. H. Stein

BY

Edgar H. Stein & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

EMIL G. H. STEIN, OF NEW YORK, N. Y.

PHONOGRAPH, GRAPHOPHONE, AND LIKE INSTRUMENT.

969,917.

Specification of Letters Patent. Patented Sept. 13, 1910.

Application filed January 6, 1910. Serial No. 536,727.

To all whom it may concern:

Be it known that I, EMIL G. H. STEIN, a citizen of the United States, and residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Phonographs, Graphophones, and Like Instruments, of which the following is a specification, such as will enable those skilled in the art to which it appertains to make and use the same.

This invention relates to graphophones, phonographs and other talking or musical instruments of this class, and the object thereof is to do away with the harsh and metallic sounds usually produced by instruments of this class, and this object I accomplish by means of an improved resonance box attachment which is substituted for the usual delivery horn, and may be attached to or used in connection with machines of the class specified without in any way changing or interfering with the construction of the machine or the box thereof.

The invention is fully disclosed in the following specification, of which the accompanying drawing forms a part, in which the separate parts of my improvement are designated by suitable reference characters in each of the views, and in which;—

Figure 1 is a side view of an ordinary graphophone and showing my improved resonance box applied thereto, said box and its attachments or connections being shown in section; Fig. 2 a plan view of the device as shown in Fig. 1; Fig. 3 a front view of the device looking in the direction of the arrow *x* in Fig. 1; Fig. 4 a partial section on the line 4—4 of Fig. 3, and;—Fig. 5 a partial section on the line 5—5 of Fig. 3.

In the drawing forming part of this specification I have shown at *a* an ordinary graphophone box provided with the usual rotary record tablet *b*, and in the practice of my invention I connect with one side of the body of the graphophone, the front side thereof as shown in the drawing, my improved resonance box *c*.

The resonance box *c* is rectangular in form, and in the form of construction shown the vertical depth thereof is slightly greater than that of the body of the graphophone box, and the transverse dimensions are slightly less than those of the body of the graphophone box, while the depth, forward and back, is about one-quarter of the ver-

tical height; but these dimensions may be varied within considerable limits without departing from the spirit of my invention or sacrificing its advantages.

The box *c* is preferably made of wood and the front *c*² thereof is made thin and forms a sounding board, and said front is also provided centrally thereof with a large central sound aperture or opening *c*³ above and below which are placed horizontal reinforcing and stiffening strips or cleats *c*⁴ and *c*⁵ which are shown in cross section in Fig. 1, in plan in Figs. 4 and 5, and indicated in dotted lines in Fig. 3. The ends of the reinforcing and stiffening strips or cleats *c*⁴ above the aperture or opening *c*³ are beveled as shown at *c*⁶ so as to form an acute angle to the sounding board *c*² in the form of construction shown, while the ends of the reinforcing strip or cleat *c*⁵ are beveled to form an obtuse angle to said sounding board, as shown at *c*⁷, but this exact formation of the ends of said reinforcing and stiffening strips or cleats is not absolutely essential. The resonance box *c* is also provided in the top portion thereof with a horizontal partition *c*⁸, in the opposite end portions of which, or on the opposite sides of the center of which are formed openings *c*⁹.

Passing horizontally through the body of the phonograph is a valve rod *d*, the rear end of which is provided with a head or handle *d*², and the front end of which enters the sound box *c* and is provided with a valve *d*³ which is of greater dimensions than the aperture or opening *c*³ in the sound board *c*² of the box *c*, and the said valve is preferably faced with felt or similar material as shown at *d*⁴.

The top of the box *c* is provided with a circular aperture or opening *c*¹⁰, and secured to the top of said sound box over said aperture or opening is a plate *e* having a semi-spherical cap *e*², in the top of which is a circular opening *e*³ and in practice I provide a tube *f* with one end of which is connected the ordinary sound reproducer *f*² provided with the usual tracing needle *f*³, and the other end of which is provided with a semi-spherical cap *f*⁴ which fits on the cap *e*² and is adapted to rotate thereon, and in the top of which is a circular opening *f*⁵ which corresponds with but is of slightly less dimensions than the opening *e*³ in the cap *e*².

The tube *f* is provided with a head *f*⁶ of

which the semi-spherical cap f^4 forms a part, and secured to the top of the box c is a bracket arm g having a horizontal head member g^2 , through which is passed a screw g^3 in vertical line with the head f^0 of the tube f , and between which and said head is placed a spiral spring h . The head f^0 of the tube f is provided with a recess f^7 in which the lower end of the spring h fits and in the upper end of said spring is placed a plug h^2 provided with a recess, in which the lower end of the screw g^3 fits and by turning the said screw, the tension of the spring h may be regulated as will be readily understood.

The parts e^2 and f^4 form a ball and socket connection between the tube f and the top of the box c and the tube f which forms an arm that carries the sound reproducer f^2 is free to rotate in the horizontal plane as the machine is operated or the record tablet b rotated, this rotation of the arm or tube f being accomplished by the needle f^3 as it moves through the grooves of the record tablet in the usual manner.

The operation will be readily understood from the foregoing description when taken in connection with the accompanying drawing and the following statement thereof.

As the machine is operated in the usual manner, the sound or vibrations produced pass through the tube or arm f into the box c or that part thereof above the partition e^8 , and thence through the opening e^9 in said partition into the main part of said box and out through the aperture or opening e^3 , and the valve rod d being movable longitudinally, the passage of the said sounds or vibrations through the said opening or aperture may be regulated by means of the valve d^3 which forms a damper for this purpose; and the partition e^8 prevents the said sounds or vibrations from passing directly from the tube or arm f into the box c and out through the opening or aperture e^3 and the movement of said sounds or vibrations is regulated and controlled by said partition.

The box c is connected with the body of the instrument by side plates i as clearly shown, and in practice the said box is supported independent of the body of the instrument except for the connecting side plates i , and also independent of the support on which the instrument is placed, the only connections or supports for the said box being the side plates i or any other suitable devices or attachments that may be employed for this purpose, and by means of this construction the vibrations from the main box of the instrument are not transmitted to the sound box and harsh or metallic sounds usually produced by instruments of this class are almost entirely obviated or done away with.

Although I have shown the rod d as passing through the box of the machine it will be apparent that my invention is not limited to this particular means for operating the valve or damper d^3 and any other suitable means or devices may be provided for this purpose; and other changes in and modifications of the construction of my improved resonance box attachment for instruments of the class specified may be made, within the scope of the appended claims, without departing from the spirit of my invention or sacrificing its advantages.

With my improvement the usual delivery horn is done away with or detached from the machine and the tube f takes its place and in the application of my improvement to the machines of the class described, all that is necessary is to detach the ordinary delivery horn and this can be done without in any way interfering with or modifying the construction of the instrument or the box thereof, and if desired my improved attachment may be removed at any time and the ordinary delivery horn employed.

I am aware that efforts have been made to provide instruments of the class specified with resonance box attachments but in all such cases said attachments involve either a change in the form of the machine or the box thereof, or employ the ordinary delivery horn, and in some cases an additional resonance box, employing a delivery horn of the usual form, is provided, but all these efforts differ from mine in the features hereinbefore set out, or in the fact that my attachment, or the use thereof necessitates no change whatever in the form or construction of the machine or the box thereof and may be supported adjacent to or in connection with the machine in any desired manner.

By means of my improvement I do away almost entirely with the harsh and metallic sounds usually produced by phonographs, graphophones and other instruments of this class, and the result is the production of full, round tones or notes, the volume of which may be regulated as desired by means of the damper or valve d^3 .

Having fully described my invention what I claim as new, and desire to secure by Letters Patent, is:—

1. A resonance box for use in connection with talking machines and adapted to be supported adjacent thereto, one side of said box forming a sounding board and being provided with an aperture or opening, and a tubular arm rotatably connected with the top of said box and in communication therewith, said arm being provided with the usual sound reproducer and tracing needle, and said aperture or opening being provided with a damper and means for regulating the same, and said box being also

provided in the top portion thereof with a horizontal partition, the opposite end portions of which are provided with openings.

2. A resonance box for use in connection with talking machines and adapted to be supported adjacent thereto, one side of said box forming a sounding board and being provided with an aperture or opening, and a tubular arm rotatably connected with the top of said box and in communication therewith, said arm being provided with the usual sound reproducer and tracing needle, and said aperture or opening being provided with a damper and means for regulating the same, and said box being also provided in the top portion thereof with a horizontal partition, the opposite end portions of which are provided with openings, and the said sounding board being provided above and below the aperture or opening therein with horizontally arranged cleats.

3. The combination with a talking machine of a resonance box, formed independently thereof and supported in front thereof, the front of said resonance box forming a sound board and being provided with an aperture or opening, a damper for controlling said aperture or opening, a tubular arm rotatably connected with the top of said resonance box and provided with the usual sound reproducer and tracing needle, said resonance box being also provided in the top portion thereof with a horizontal partition having apertures or openings.

4. A resonance box for use in connection with a talking machine, means for support-

ing said box in front of said machine, the front of said box forming a sounding board and being provided with an aperture or opening, a damper for said opening (out of contact with said sounding board) and means for regulating same, and a tubular arm rotatably connected with the top of said box and in communication therewith and provided with a sound reproducer and tracing needle.

5. A resonance box for use in connection with talking machines, means for supporting said box in front of said machine, the front of said box forming a sounding board and being provided with an aperture or opening, a damper for said opening and a tubular arm rotatably connected with the top of said box and in communication therewith, the connection of said arm with the top of said box being formed by means of a ball and socket joint, part of which is connected with the top of said box and part with said arm, and a spring tension device supported above said ball and socket joint and adapted to bear on that part thereof that is connected with said arm, said arm being also provided with the usual sound reproducer and tracing needle.

In testimony that I claim the foregoing as my invention I have signed my name in presence of the subscribing witnesses this 4th day of January 1910.

EMIL G. H. STEIN.

Witnesses:

C. E. MULREANY,
B. M. RYERSON.

E. GILBERT.
 RECORD EJECTOR FOR PHONOGRAPHS.
 APPLICATION FILED DEC. 18, 1902.

969,946.

Patented Sept. 13, 1910.

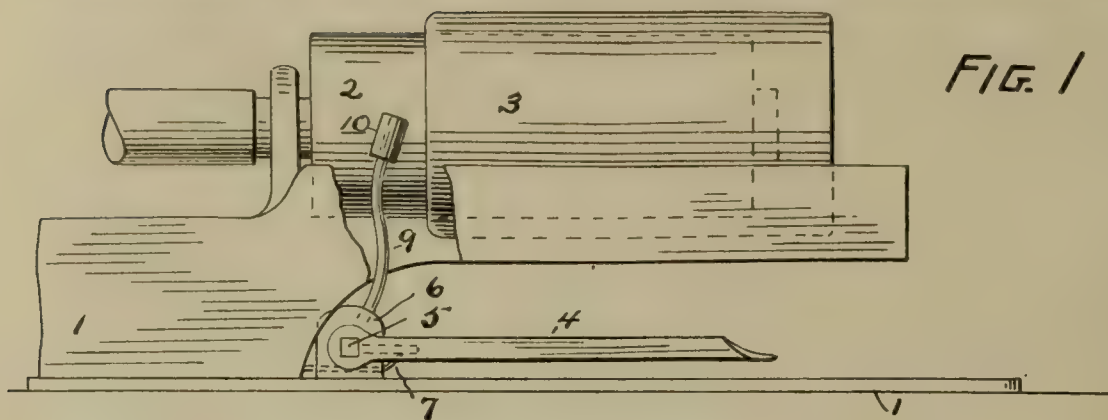


FIG. 1

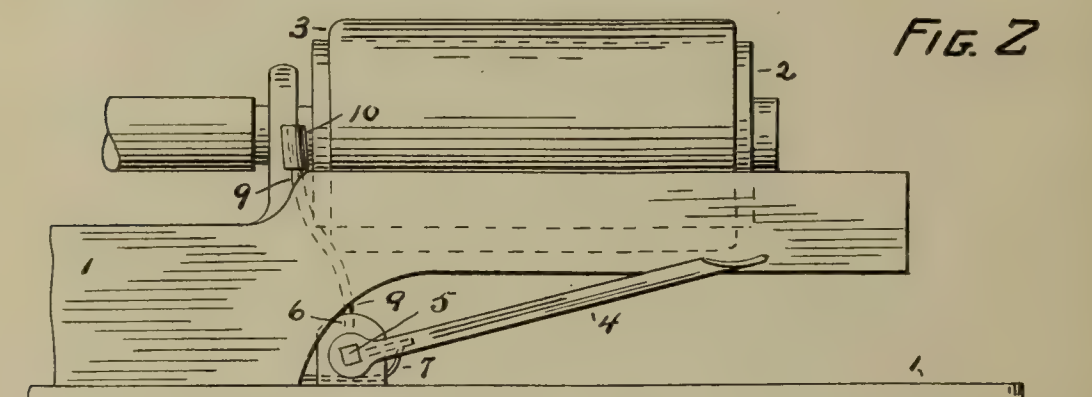


FIG. 2

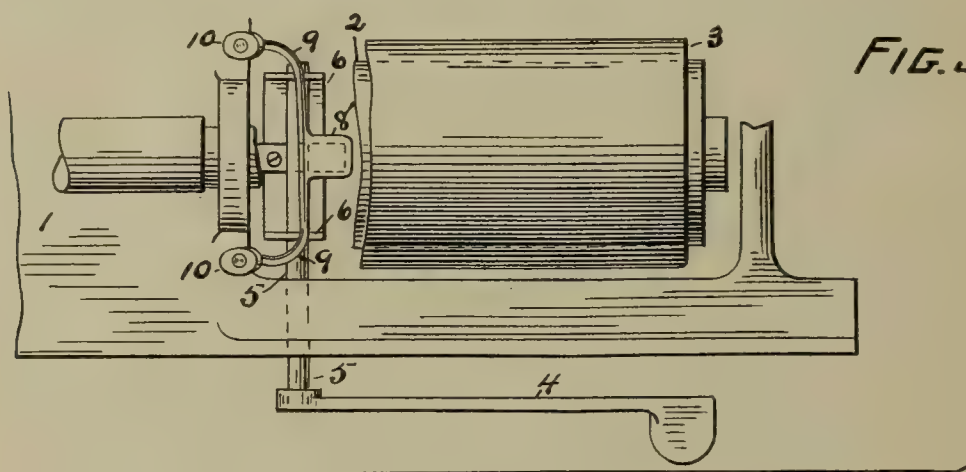
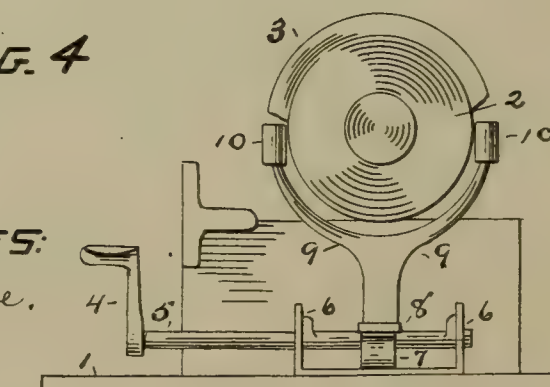


FIG. 3

FIG. 4



WITNESSES:

Walter F. Lane.
 C. B. Richards

INVENTOR:
 E. Gilbert
 by W. A. L. L. L.
 his atty.

UNITED STATES PATENT OFFICE.

ELAM GILBERT, OF PORTLAND, OREGON; MATTIE R. GILBERT GUARDIAN OF SAID
ELAM GILBERT, INSANE.

RECORD-EJECTOR FOR PHONOGRAPHS.

969,946.

Specification of Letters Patent. Patented Sept. 13, 1910.

Application filed December 18, 1902. Serial No. 135,691.

To all whom it may concern:

Be it known that I, ELAM GILBERT, a citizen of the United States, residing at Portland, county of Multnomah, State of Oregon, have invented certain new and useful Improvements in Record-Ejectors for Phonographs; and I do hereby declare the following to be a full, clear, and exact description of the same.

10 The present invention relates to a new and useful device whereby the record of a phonograph or graphophone may be automatically ejected from the record cylinder without injury to the wax surface of the said
15 record, thereby obviating mutilation of the record by being required to loosen and draw the record from the record cylinder by hand.

To comprehend the invention reference should be had to the accompanying sheet of
20 drawings, wherein—

Figure 1 is a detail front view in elevation, partly broken away, illustrating the position of the ejector when thrown to eject the record from the record cylinder; Fig. 2
25 is a front view illustrating the position of the ejector when the record is inward its full distance; Fig. 3 is a top plan view of the mechanism disclosed by Fig. 2 of the drawings, the record and the record cylinder being partly broken; and Fig. 4 is an end view
30 in elevation, the record being broken away.

The numeral 1 is used to indicate the phonograph bed, and 2 the record cylinder. Upon this cylinder slips the record 3, being
35 held thereon by friction.

To the bed of the phonograph is connected the ejector for removing the record from the cylinder, the same comprising a lever 4 secured to one end of the oscillatory shaft
40 5, which shaft works in bearings 6 attached to the bed 1. This lever 4 is normally held upward by the pressure of spring 7, interposed between the bed 1 and extension shoulder or lug 8 forwardly projecting from
45 shaft 5.

The oscillatory shaft 5 carries the upwardly extending lever or ejector arms 9, the upper end of which arms rest immediately back of the inner edge of the record
50 3 so that when said arms are thrown forward, by the downward movement of the lever 4, they are forced against the said end or edge of the record 3 and throw same forward or outward upon the cylinder 2 with

an even pressure beyond the receiving end 55 of the said cylinder. If the lever 4 be thrown downward under a quick movement, the record 3 may be ejected the entire length of the record cylinder. However, the object is simply to force the outer portion of the
60 record a short distance beyond the receiving end of the record cylinder, so as to enable the same to be removed easily by the operator and thereby doing away with the necessity of exerting strain upon the record for
65 this purpose. By thus ejecting the record from the record cylinder, danger of mutilating the record by pulling same off of the said record cylinder is avoided.

To provide against the lever or ejector 70 arms injuring the inner edge of the record 3 against which they act, each arm has secured thereon an elastic cushion, or sleeve 10 which bears upon the edge of the record during the operation of ejecting same. 75

Having thus described the invention, what is claimed as new and desired to be protected by Letters Patent, is—

1. In a phonograph, the combination with the record cylinder, of the ejector arms arranged to bear against the inner edge of the record, and means whereby the ejector arms are actuated to force the record outwardly upon the record cylinder. 80

2. In a phonograph, the combination with 85 the phonograph bed, of the record cylinder, of an oscillatory shaft attached to the bed, a lever for actuating same, the ejector arms carried thereby, and a spring for restoring the oscillatory shaft to its normal position. 90

3. In a phonograph, the combination with the record cylinder, of lever actuated means whereby a record is ejected from the record cylinder.

4. In a phonograph, the combination with 95 the record cylinder, of the ejector arm arranged to bear against the inner edge of the record, a protecting cushion or sleeve secured to said arm, and means whereby the ejector arm is actuated to force the record outwardly upon the record cylinder. 100

5. In a phonograph structure, a movable phonograph record ejector mounted upon the phonograph structure and operative to engage and remove the record from its manifold. 105

6. In a phonograph, the combination with a cylindrical phonograph record, of means

mounted upon the phonograph structure for ejecting the record from its mandrel.

7. In a phonograph, the combination with a cylindrical phonograph record, of means
5 consisting of a lever mounted upon the phonograph structure for ejecting the record from its mandrel.

8. In a phonograph, the combination with a phonograph record, of means mounted
10 upon the phonograph structure for ejecting the record from its support.

9. In a talking machine, the combination with a talking machine record support, of means mounted upon the talking machine

structure for ejecting a record from said 15 support.

10. In a talking machine, the combination with a talking machine record support, of means on the talking machine structure for engaging a talking record and shifting the 20 same relative to the support.

In witness whereof I have hereunto set my hand.

ELAM GILBERT.

Witnesses:

N. A. ACKER,

D. B. RICHARDS.

A. URBAHNS.
 PHONOGRAPH REPRODUCER.
 APPLICATION FILED MAR. 17, 1910.

970,142.

Patented Sept. 13, 1910.

Fig. 1,

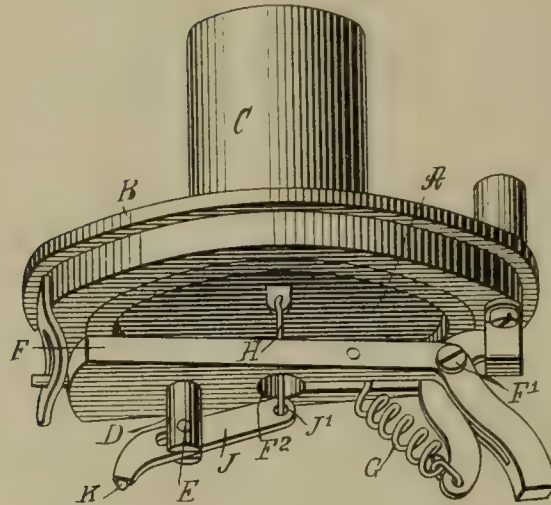


Fig. 2,

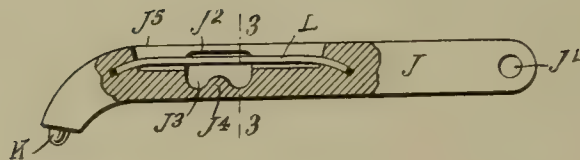
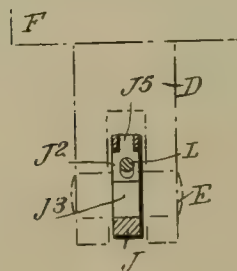


Fig. 3.



WITNESSES:

Edward Thorpe
A. Kernon

INVENTOR
Anthony Urbahns
 BY *Mumford*
 ATTORNEYS

UNITED STATES PATENT OFFICE.

ANTHONY URBHANS, OF MINDEN, IOWA.

PHONOGRAPH-REPRODUCER.

970,142.

Specification of Letters Patent. Patented Sept. 13, 1910.

Application filed March 17, 1910. Serial No. 549,837.

To all whom it may concern:

Be it known that I, ANTHONY URBHANS, a citizen of the United States, and a resident of Minden, in the county of Pottawattamie and State of Iowa, have invented a new and Improved Phonograph-Reproducer, of which the following is a full, clear, and exact description.

My invention relates to phonograph reproducers, and has for its object to enable the loudness of the sound to be varied as may be desirable, in view of the size of the room in which the phonograph is operated, or in accordance with the character of the music or other matter played. For this purpose I have provided a certain novel construction of a variable connection between the vibrating diaphragm and the record-engaging point or jewel.

A specific embodiment of my invention is illustrated in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, and in which—

Figure 1 is a perspective view showing my improvement applied to the reproducer of a Columbia cylinder phonograph; Fig. 2 is a separate view of the reproducer lever, with parts in section, to disclose my improved construction of this part; and Fig. 3 is a cross section on the line 3—3 of Fig. 2, showing also, in dotted lines, the fulcrum of the reproducer lever.

In its general features, the reproducer shown in Fig. 1 does not differ from the one now used with Columbia cylinder phonographs.

A is a diaphragm suitably secured in a casing B provided with a sound conduit C, and a forked post D, carrying a fulcrum pin E, is secured to an arm F fulcrumed at F', and under the influence of a spring G. From the diaphragm A an operating link H extends through an opening F² in the arm F.

So far as above described, the parts may be of any usual or approved construction.

My invention relates more particularly to the reproducer lever J, connected with the link H at J'. This lever, instead of simply swinging on the fulcrum E, as in the ordinary construction, is also capable of sliding lengthwise, thereby varying the distance between the fulcrum E and the reproducing

point or jewel K adapted to engage the sound record, and also varying the distance between the said fulcrum and the operating connection at J'. For instance, the fulcrum pin E passes through a transverse slot or recess J², the extent of which, measured lengthwise of the lever J, is considerably greater than the width or diameter of the fulcrum pin, and the slot is preferably made with a plurality of notches J³ in one of its longitudinal walls (the lower wall is shown), a bevel-faced projection, such as J⁴, separating the adjacent notches. The latter form seats for the fulcrum pin, which is forced into one notch or the other, and held therein, by a spring L engaging the fulcrum pin E on the side opposite the notches. This spring may extend lengthwise within a longitudinal recess J⁵, intersecting the transverse recess J², the ends of the spring being secured to the lever. By pressing down on the lever J, the fulcrum pin E will be caused to enter the portion of the slot J² above the projection J⁴, and then the lever can be slid lengthwise on the fulcrum pin to bring the latter into registry with one or the other notch J³, the spring L bringing the pin E into such notch as soon as the lever J is released. A simple pull on the lever lengthwise, will also shift it for adjustment. I am thus enabled to vary the leverage of the lever J, and this also varies the pressure exerted on the diaphragm A by the movements of the lever J and of the operating link H, and therefore the loudness of the sounds emitted. The sounds will be loudest when the fulcrum pin E is nearest the reproducing point K.

Loud sounds will be emitted when the instrument is played in large halls or in the open air, also for certain classes of music, such as dances or band music, while soft sounds are better adapted to songs and to entertainment in the home.

While I have shown two notches J³, the number could be varied, of course, and other modifications may be made without departing from the nature of my invention, as set forth in the claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A reproducer for talking machines, provided with a vibrating diaphragm, a reproducing lever operatively connected with

the diaphragm and adapted to engage the sound record, said lever being provided with an elongated transverse recess notched at different distances from its end, a fulcrum pin extending through said recess and adapted to become seated in said notches, and a spring carried by the lever and engaging the fulcrum pin on the side opposite said notches.

2. A reproducer for talking machines, provided with a vibrating diaphragm, a reproducing lever operatively connected with the diaphragm and adapted to engage the sound record, said lever being provided with an elongated transverse recess notched at different distances from its end, and with a longitudinal recess intersecting said transverse recess, a fulcrum pin extending through said transverse recess and adapted to become seated in said notches, and a spring carried by the lever and extending lengthwise of the lever within its longitudinal recess, said spring engaging the fulcrum pin on the side opposite to said notches.
3. A reproducer for talking machines, provided with a vibrating diaphragm, a reproducing lever operatively connected with the diaphragm and adapted to engage the sound record, said lever being provided with an elongated transverse recess notched at different distance from its end, a fulcrum pin extending through said recess and adapted to become seated in said notches,

and elastic means for holding the fulcrum pin in any one of said notches.

4. A reproducer for talking machines, provided with a vibrating diaphragm, a reproducing lever operatively connected with the diaphragm and adapted to engage the sound record, said lever being provided with an elongated transverse recess notched at different distances from its end, and provided with a bevel faced projection between adjacent notches, a fulcrum pin extending through said recess and adapted to become seated in said notches, and elastic means for holding the fulcrum pins in any one of said notches.

5. A reproducer for talking machines, provided with a vibrating diaphragm, a reproducing lever operatively connected with the diaphragm and adapted to engage the sound record, said lever being provided with an elongated transverse recess, a fulcrum pin extending through said recess, and elastic means for pressing said pin against one of the walls of the recess and preventing accidental longitudinal movement of the lever.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANTHONY URBAHNS.

Witnesses:

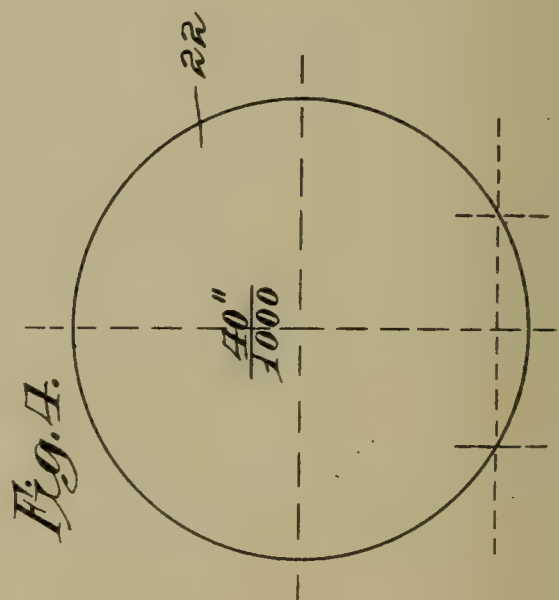
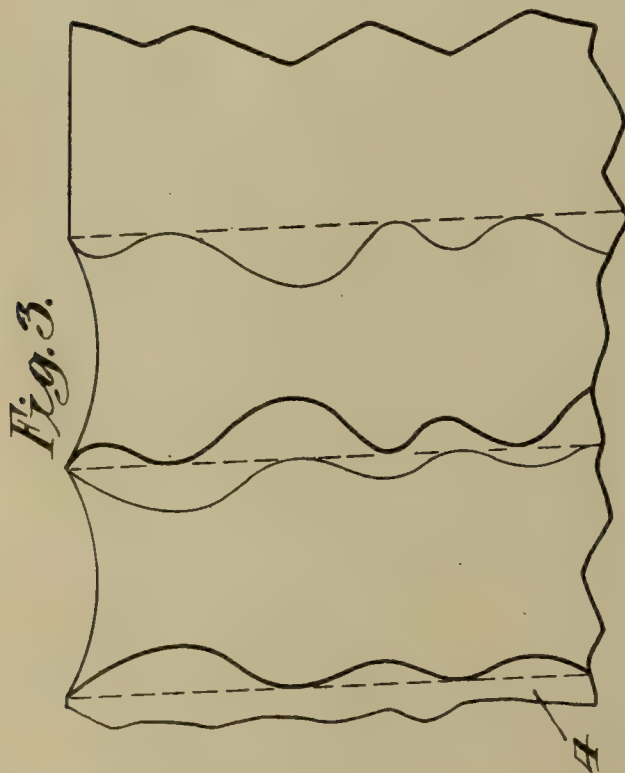
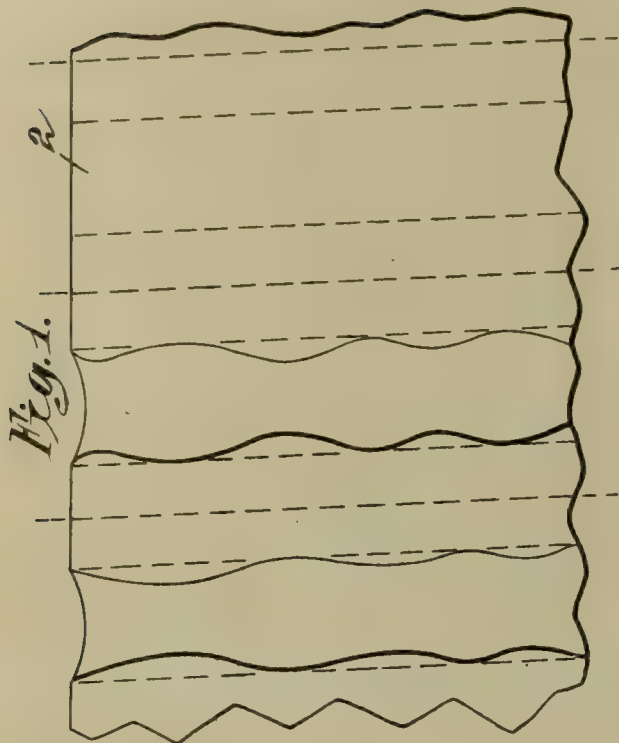
JOHN GEIGER,
JOHN ALBRECHT.

T. A. EDISON.
METHOD AND APPARATUS FOR MAKING SOUND RECORDS.
APPLICATION FILED AUG. 30, 1904.

970,615.

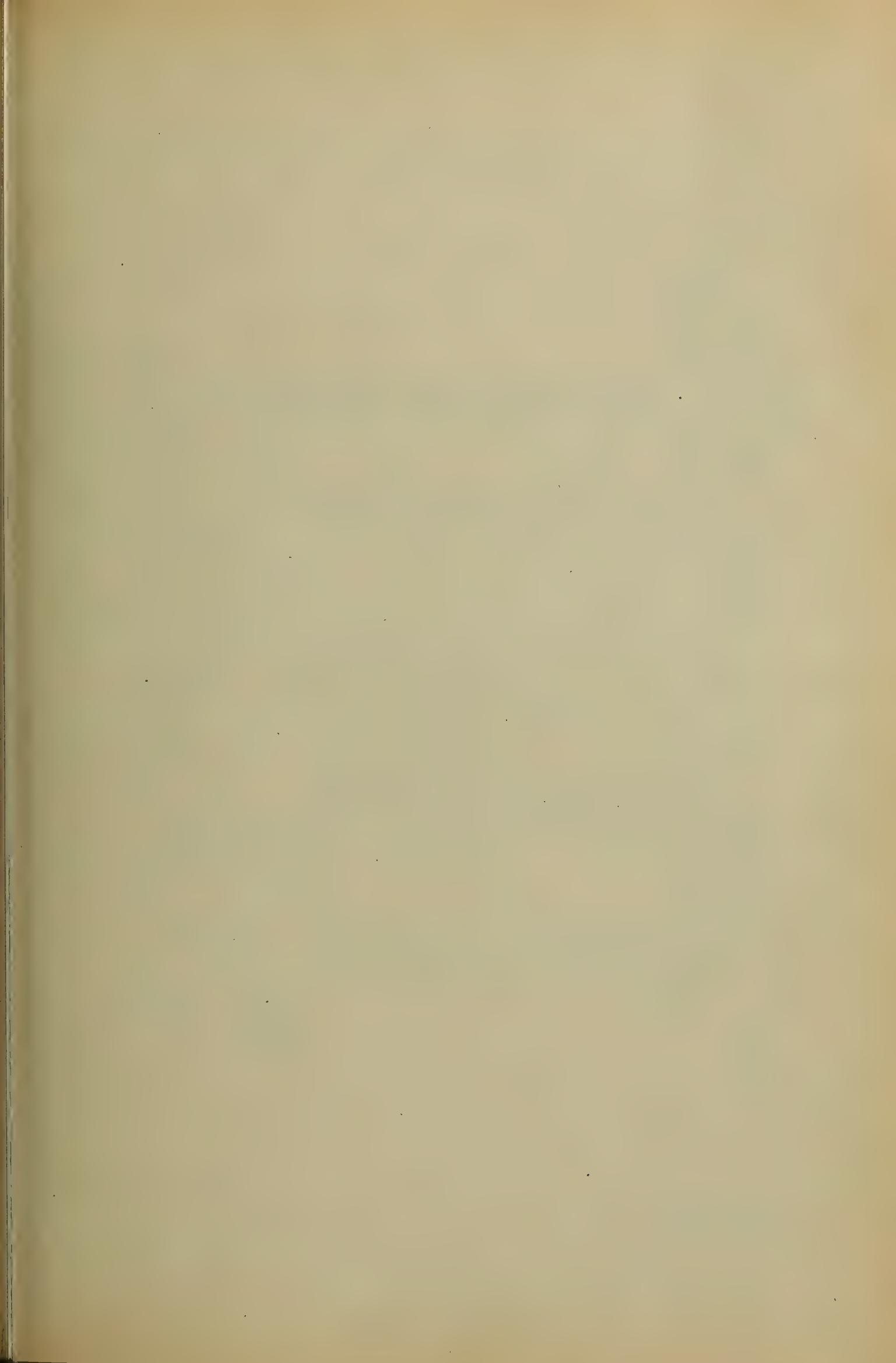
Patented Sept. 20, 1910.

4 SHEETS—SHEET 1.



Witnesses
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Mina C. Mac Arthur

Inventor
Thomas A. Edison
By his Attorney
Frank L. Spence



T. A. EDISON.
METHOD AND APPARATUS FOR MAKING SOUND RECORDS.
APPLICATION FILED AUG. 30, 1904.

970,615.

Patented Sept. 20, 1910.

4 SHEETS—SHEET 2.

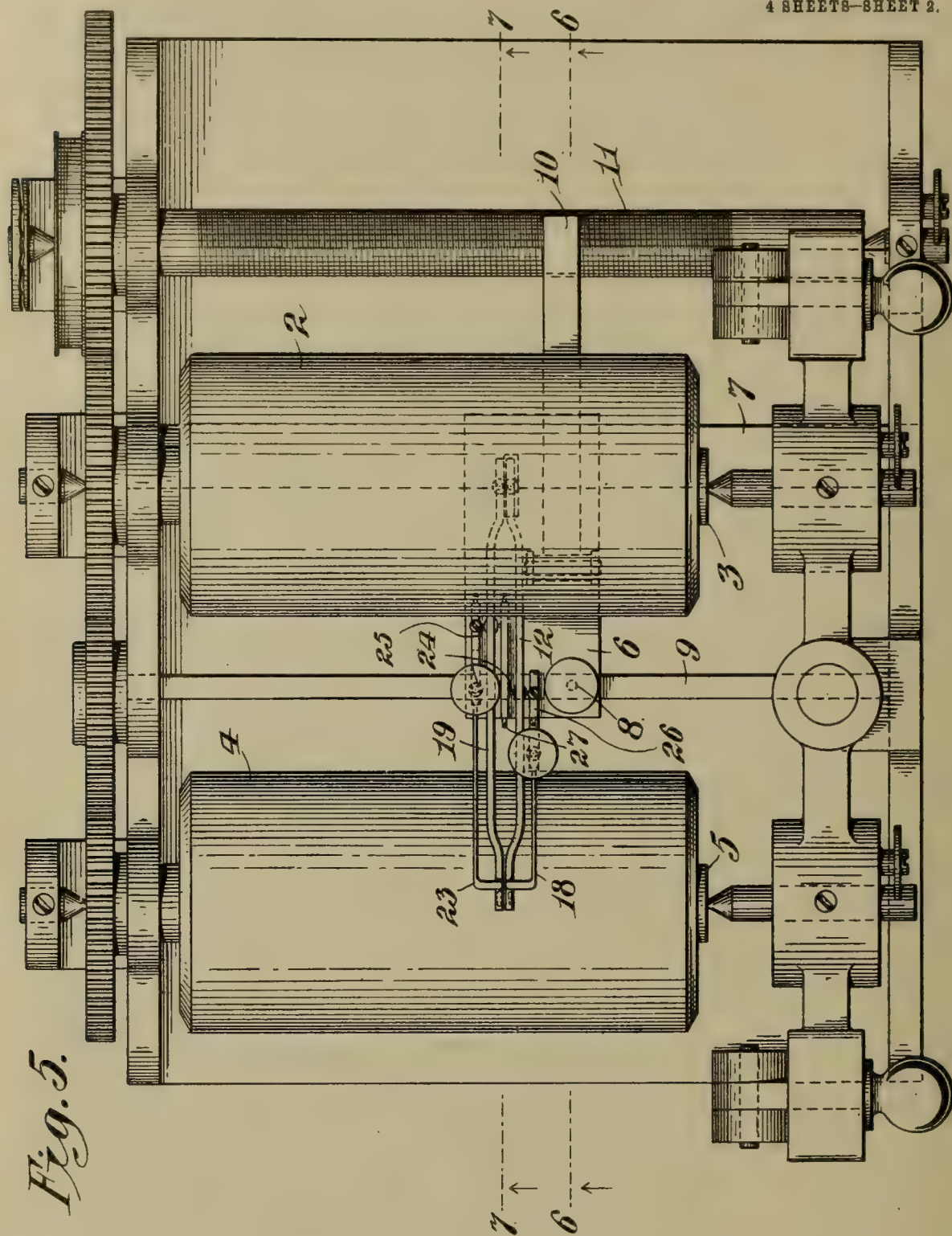


Fig. 5.

Witnesses
Edgeworth Currier
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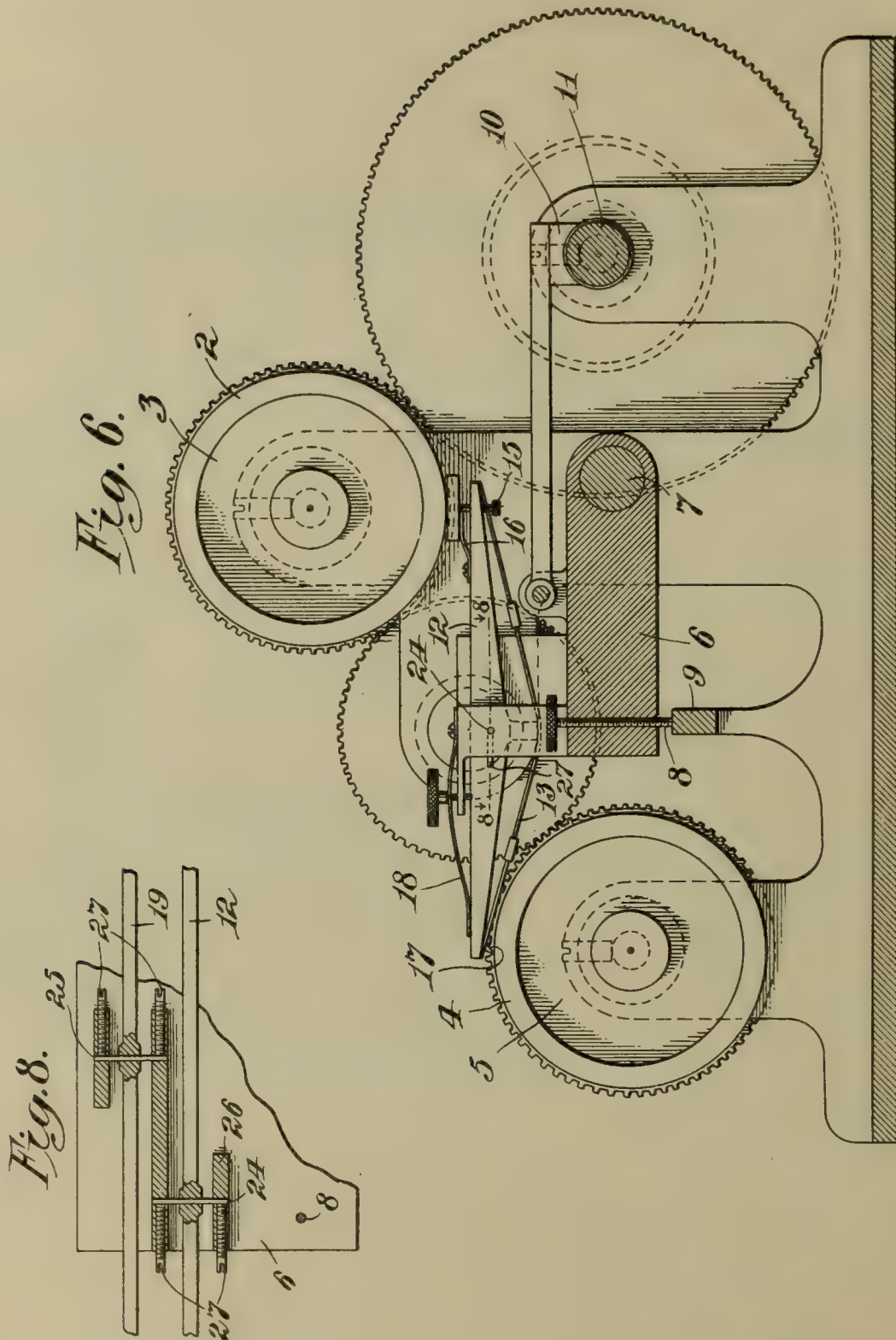
Inventor
Thomas A. Edison
By his Attorney
Frank L. Brown

T. A. EDISON.
METHOD AND APPARATUS FOR MAKING SOUND RECORDS.
APPLICATION FILED AUG. 30, 1904.

970,615.

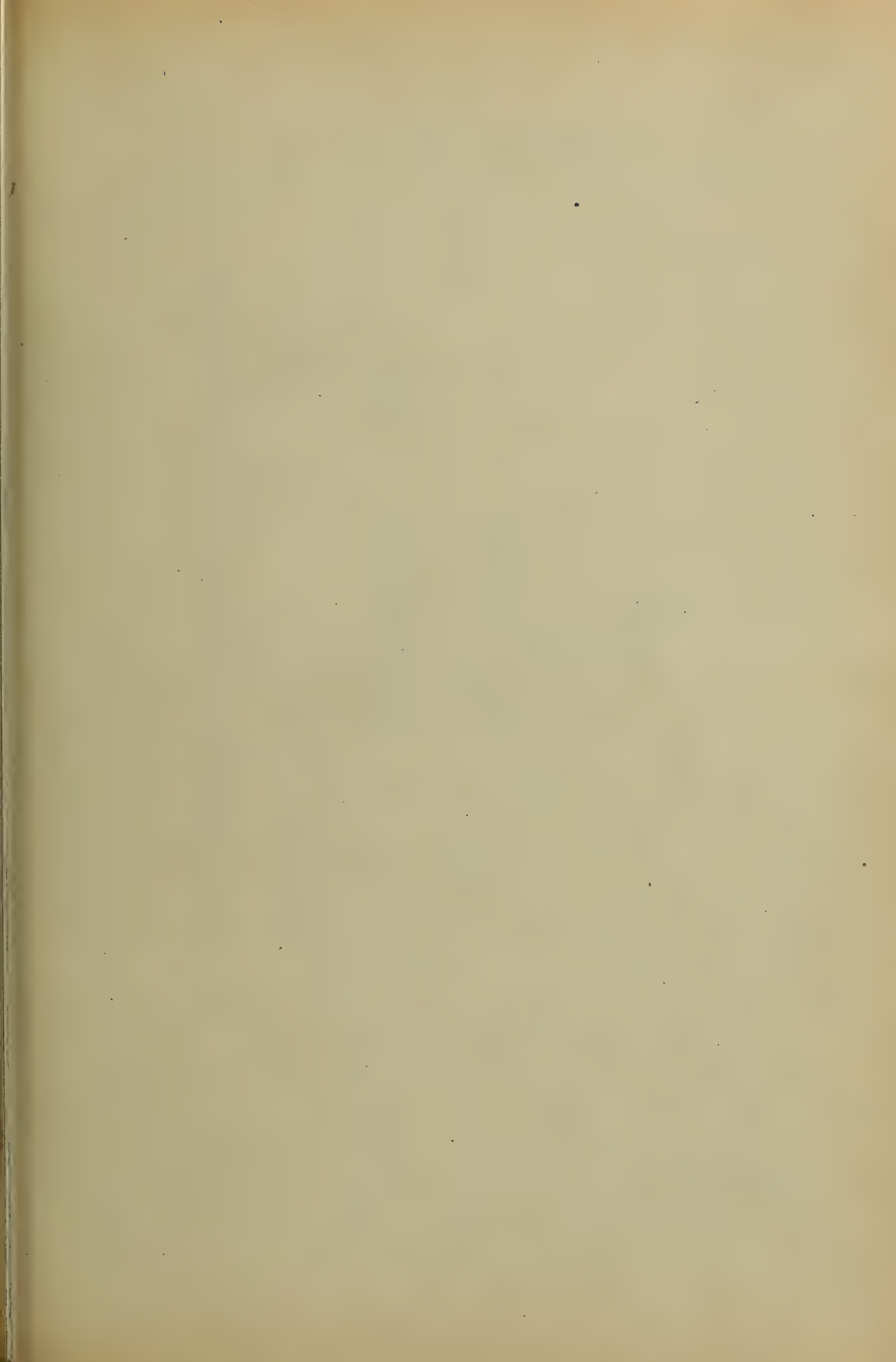
Patented Sept. 20, 1910.

4 SHEETS—SHEET 3.



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Maurice C. MacArthur

Inventor
Thomas A. Edison
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Brandt L. Raper



T. A. EDISON.
METHOD AND APPARATUS FOR MAKING SOUND RECORDS.
APPLICATION FILED AUG. 30, 1904.

970,615.

Patented Sept. 20, 1910.

4 SHEETS—SHEET 4.

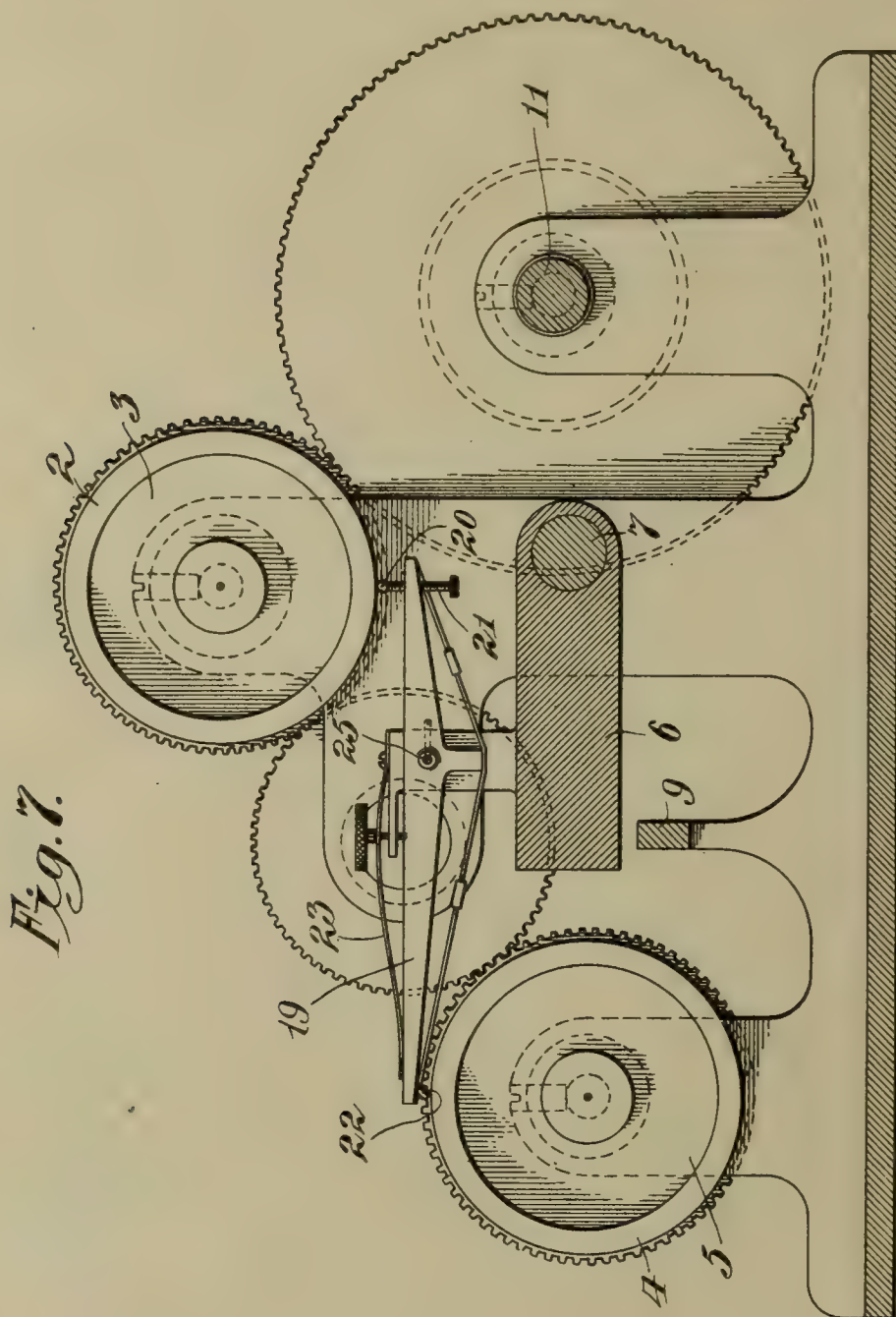


Fig. 7.

Witnesses
Edgeworth
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Inventor
Thomas A. Edison
By his Attorney
Frank L. Rice

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, ORANGE, NEW JERSEY.

METHOD AND APPARATUS FOR MAKING SOUND-RECORDS.

970,615.

Specification of Letters Patent. Patented Sept. 20, 1910.

Application filed August 30, 1904. Serial No. 222,702.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, Orange, Essex county, New Jersey, have invented a certain new and Improved Method and Apparatus for Making Sound-Records, of which the following is a description.

My invention relates to an improved apparatus for making phonograph, or other talking machine records, and my object is to secure a sound record which shall be of practically exact quality, and at the same time very loud. Such a record when secured, may be used directly on the phonograph or other sound reproducing machine, but it is preferably employed as a master from which copies are obtained by any approved process of duplication, as for example, by a molding operation.

The invention is practicable for use not only for the production of phonograph records, but also for the production of so-called gramophone records, wherein the record exists as a sinuous groove of substantially uniform depth.

In making a sound record of either of the types referred to, there are certain factors which enter into the operations and by reason of which the quality of the recorded sounds is affected so that the record is not truly representative of the original sounds. The most objectionable of these disturbing influences which I have encountered in my experiments in phonographic recording, is due to the inertia and momentum of the diaphragm and the recording devices, carried by or connected with the same. As a result, when the diaphragm is subjected to vibrations of considerable amplitude, the momentum of the parts causes the recording knife to cut to a disproportionately great depth, and this aberration is manifested in the succeeding vibrations. Consequently, I find that the quality of the recorded sounds is in inverse ratio to the loudness thereof, so that when the attempt is made to make a very deep record, or a record of great amplitude, the louder notes are generally of poor quality, and are out of proportion to the notes or sounds of less amplitude. Another disturbing influence, which I have encountered in my experiments with the phonograph, and by which the quality of the records is affected, is due to the fact that the

horns heretofore used have been responsive to certain tones, either fundamental or secondary, within the range of ordinary music, and in consequence, such tones are greatly emphasized and become objectionably distorted in the reproduction. Obviously, the tones which may thus become unduly amplified, depend upon the length of the horn used, but since it has been heretofore necessary to employ horns of considerable length, say from 18 to 36 inches, in order that the sounds may be properly collected to make the record loud enough for practical purposes, the tones to which they may be responsive, either fundamental or secondary, will always exist in the range of ordinary music. I am not aware that these objections have ever been successfully overcome, and heretofore, the volume of a phonograph, or other sound record has been largely restricted because of the same.

The object of my invention is to overcome these objections.

To this end, the invention consists, in the features hereinafter set forth and claimed.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a diagrammatic view showing a portion of the original master, or metallic copy thereof. Fig. 2 is a cross sectional view through the original recording style, showing a recorder .020 of an inch in diameter the scale being one-half that of Fig. 1. Fig. 3 a diagrammatic view of the amplified duplicate record. Fig. 4 a cross sectional view through the recorder used in cutting the amplified duplicate, illustrating the same cutting to its full depth the scale being one-half that of Fig. 3. Fig. 5 a plan view of a preferred embodiment of the mechanical duplicating apparatus. Fig. 6 a cross sectional view showing the shaving knife for trimming the blank to the exact shape and size as the original record. Fig. 7 a corresponding view showing the mechanism for securing the amplified copy of the original record, and Fig. 8 a sectional view on the line 8—8 of Fig. 6. In all of the above views, corresponding parts are represented by the same numerals of reference.

In carrying the method into effect, I first make an original record by means of a recorder 1, (see Fig. 2) of small cross section,

the record being of low amplitude. Thus, in Fig. 1, I illustrate such a record, wherein the maximum width of the record groove is only about one-half the available surface, or
 5 about one two-hundredth of an inch. In making such a record, I am enabled to employ a very short horn, say from four to five inches in length, owing to the low amplitude of the sounds to be recorded; and
 10 such a horn is not responsive to an injurious extent to any tones within the range of ordinary music, so that the objectionable "funnel tones" may be eliminated. I find that records of this kind, although very
 15 faint, are of superior quality, not only because the work imposed on the recorder is slight, and consequently, the recorder is free to more readily respond to the original sounds, but also and principally, because the
 20 vibrations are not affected to a noticeable extent by the momentum of the parts, so that disturbances from that cause are practically eliminated. Obviously, the quality of the master record so obtained will be fur-
 25 ther improved by the employment of a very short horn, as explained, and by which the formation of "funnel tones" will be substantially overcome. Having obtained a master of this kind with a substantially per-
 30 fect record thereon of low amplitude, I secure a metallic copy therefrom by any suitable duplicating process, as for example, those described in my patents, Nos. 657,527 and 680,520, dated September 11, 1900, and
 35 August 13, 1901, respectively. I now obtain an amplified copy of the metallic master thus secured, preferably in an apparatus by which the record is mechanically transferred and amplified. In such an apparatus deal-
 40 ing with vibrations of excessive minuteness, it is necessary that the surface on which the record is transferred should be of the exact shape as the metallic master.

It would be very difficult to secure a metallic master that would be absolutely cylindrical and much more difficult to secure a blank of absolutely the same size, and for this reason I prefer to make use of a shaving device, working in advance of the re-
 50 corder and by means of which the blank will be cut to the exact size and shape of the master immediately before the record is cut therein. A suitable apparatus for the purpose is indicated in the drawings wherein
 55 the metal master 2 is carried on the mandrel 3, and the blank 4 is carried on the mandrel 5. These mandrels are rotated simultaneously by any suitable gearing at a low speed, so that the surface speed of the
 60 master is sufficiently low as to prevent any disturbing influence due to momentum or inertia of the moving parts. A carriage 6 is mounted to travel on a rod 7, and at its forward end is supported by a regulating
 65 screw 8, working on a front bar 9. The

carriage is fed longitudinally by a feed nut 10, engaging a feed screw 11. Mounted on the carriage is a lever 12, pivoted centrally and very much exaggerated in the drawings, since in actual practice the master and blank
 70 would be located very close together and a very short lever would be used. Preferably, the lever 12 is in the form of a small truss, so as to possess the maximum rigidity, and in order to prevent any flexing of the lever
 75 in operation, I prefer to maintain it under a condition of stress, as for example, by means of small adjustable tie rods 13. By stressing the lever practically to the end of the elastic limits, I secure a perfectly rigid
 80 construction by means of which the most minute movements of one end will be transmitted to the full extent at the other end thereof. At one end, the lever carries a shoe 14, made preferably of sapphire, and adjust-
 85 ed by a screw 15, said shoe bearing upon the surface of the master 2 and being wide enough to overlap several of the record grooves thereon. This shoe may be carried from a spring 16, as shown. At its other
 90 end, the lever 12 carries a cutting or shaving knife 17, made of sapphire, and of any suitable shape for engaging the blank 4. A spring 18 maintains the shoe 14 and knife 17 in engagement with the master and blank
 95 respectively. Obviously, when the master and blank are rotated, with the shoe 14 in engagement with the former, the knife 17 will cut the blank to the exact shape and size as the master. The carriage 6 also
 100 carries a duplicating lever 19, (see Fig. 7) whose pivot is so arranged as to give the desired amplification. Ordinarily, an amplification of two to one will be sufficient. This lever is constructed like the lever 12,
 105 and is also maintained under normal tension, being stressed practically to its elastic limits, so as to be free from vibrations. At one end, the lever 19 carries the reproducing ball 20 from the adjusting screw 21, and at
 110 the other end is provided with a recorder 22, which as shown in Fig. 4, is preferably of a diameter of about .040 of an inch. The recorder and reproducer are maintained in engagement with the blank and master
 115 respectively, by an adjustable spring 23.

In order that there may not be any lost motion at the pivots of the levers 12 and 19, I preferably mount these levers on very
 120 small torsion wires 24 and 25, carried on the brackets 26 upon the carriage 6 and held from rotary movement by the screws 27. Consequently, any movements of the levers 12 and 19 are afforded by torsional elasticity
 125 of the pivots 24 and 25, which movements are obviously slight, since the movements of the ends of the levers rarely exceed a thousandth of an inch, in practice. The recorder and reproducer work closely adja-
 130 cent to the shaving knife 17 and shoe 14, as

shown, so that a sound record will be cut in the blank 4 immediately after it is trimmed off to the proper shape. By means of the duplicating mechanism described, the blank 5 4 will be provided with a record therein (see Fig. 3) which will correspond with that on the original master, except that it will be very much amplified. Such a record will be obviously of superior quality since, of course, 10 the mandrels 3 and 5 will be rotated slowly enough as to prevent any momentum of the parts from affecting the duplication. The finished amplified duplicate record may now be used directly for reproduction, but it is 15 preferably employed as a master from which duplicates are secured in any suitable way, such as by a molding process. Any other duplicating process well known to those skilled in the art, may however, be employed 20 for securing copies from such a master.

Having now described my invention, what I claim as new therein and desire to secure by Letters Patent is as follows:

1. The process of making sound records, 25 which consists in mounting a blank upon a rotating support, trimming the blank and then, without any alteration of the position of the blank upon its support, engaging with the blank a recording stylus which is mechanically connected with a reproducer 30 stylus tracking a master record, and rotating the master and blank at such slow speed as to practically eliminate defects due to momentum and inertia of the moving parts.

35 2. The process of making sound records, which consists in making a master record of low amplitude, in rotating the same adjacent to a rotating blank, engaging with the master and blank respectively a repro- 40 ducer stylus and recording stylus connected by an amplifying lever connection, and in rotating the master and blank at such slow speed as to practically eliminate defects due to momentum and inertia of the moving 45 parts, substantially as set forth.

3. The process of making sound records, which consists in first securing a record of low amplitude, in rotating the same adjacent to a rotating blank, engaging a cutting 50 knife with the blank, regulating the cutting knife by the rotating master whereby the blank will be trimmed to the exact shape of the master, and in mechanically recording on the blank an amplified copy of the record 55 on the master by mechanical transference, substantially as set forth.

4. The process of making sound records, which consists in first securing a record of low amplitude, in rotating the same adjacent to a rotating blank, engaging a cutting 60 knife with the blank, regulating the cutting knife by the rotating master, whereby the blank will be trimmed to the exact shape of the master, and in mechanically 65 recording on the blank immediately after

the action of the cutting knife an amplified copy of the record on the master by mechanical transference, substantially as set forth.

5. The process of making sound records, which consists in making a master record 70 of low amplitude comprising the use of a recording horn of such short length as to be irresponsive to tones within the range of ordinary music, and obtaining an amplified duplicate from said master record by me- 75 chanical transference, substantially as set forth.

6. The process of making sound records, which consists in making a master record of abnormally low amplitude, and obtaining 80 from said master record by amplifying mechanical transference a duplicate of normal or desired amplitude, substantially as set forth.

7. Apparatus for making sound records, 85 which consists of two rotating mandrels, one carrying a master and the other a blank, of a pivoted lever, a shaving tool carried by the lever and engaging the blank, and a shoe on the lever engaging the master, as 90 and for the purposes set forth.

8. Apparatus for making sound records, which consists of two rotating mandrels, one carrying a master and the other a blank, of a pivoted lever, a shaving tool carried by 95 the lever and engaging the blank, and a shoe on the lever engaging the master, a second lever, a recorder carried by said lever engaging the blank, and a reproducer carried by the same engaging the record on the mas- 100 ter, as and for the purposes set forth.

9. In apparatus for making sound records, the combination with two rotating mandrels, one carrying a master record, and the other 105 a blank, of a duplicating lever maintained under normal stress, a recorder carried by the lever and engaging the blank, and a reproducer carried by the lever engaging the record on the master, as and for the purposes 110 set forth.

10. In apparatus for making sound records, the combination with two rotating mandrels, one carrying a master and the other a blank, of a pivoted lever, a shaving 115 tool carried by the lever and engaging the blank, a shoe on the lever engaging the master and means for adjusting said shoe, as and for the purposes set forth.

11. In apparatus for making phonograph records, the combination with two rotating 120 mandrels, one carrying a master and the other a blank, of a pivoted lever maintained under normal stress, a shaving tool carried by the lever and engaging the blank, and a shoe on the lever engaging the master, as 125 and for the purposes set forth.

12. In apparatus for making sound records, the combination with two rotating mandrels, one carrying a master and the other a blank, of a pivoted lever, tie rods for 130

maintaining the lever under normal stress, a shaving tool carried at one end of the lever and engaging the blank, and a shoe at the other end of the lever engaging the master, as and for the purposes set forth.

13. In apparatus for making sound records, the combination with two rotating mandrels, one carrying a master and the other a blank, of a lever mounted on a fixed pivot capable of torsional movement, a shaving tool carried at one end of the lever and engaging a blank, and a shoe carried at the other end of the lever engaging the master, as and for the purposes set forth.

14. In apparatus for making sound records, the combination with two rotating

mandrels, one carrying the master record and the other a blank, of a duplicating lever mounted on a torsional pivot, and a reproducer carried by the lever and engaging the record on the master, as and for the purposes set forth.

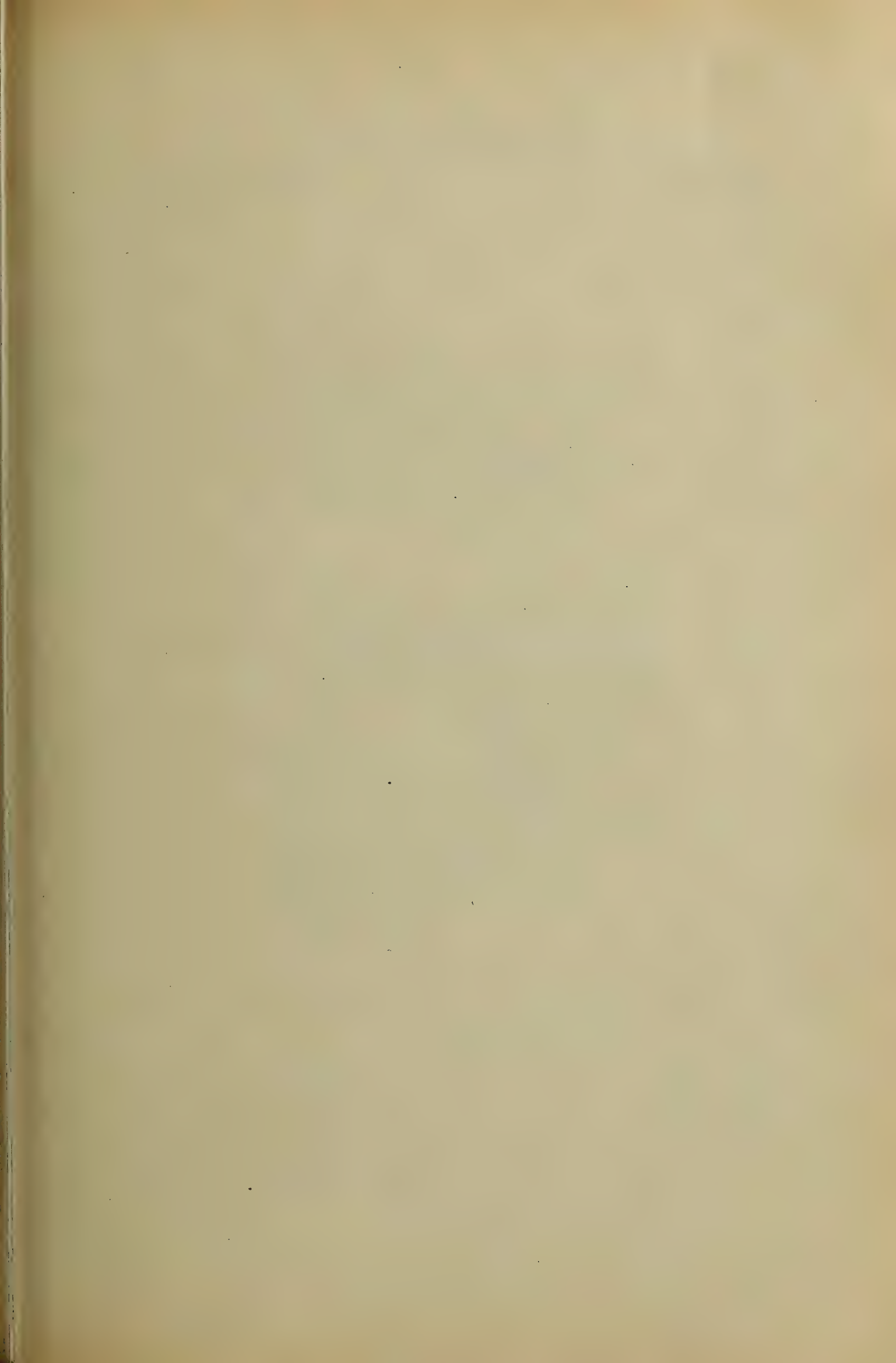
15. In phonographic transfer duplicating mechanism, a transfer lever consisting of a truss maintained normally under stress within the limit of elasticity, as set forth.

This specification signed and witnessed this 23rd day of Aug. 1904.

THOMAS A. EDISON.

Witnesses:

FRANK L. DYER,
MINA C. MACARTHUR.



G. OULTON, C. ABLETT & W. E. LIGHTFOOT.
SOUND RECORDING AND REPRODUCING MACHINE.
APPLICATION FILED JULY 19, 1909.

971,068.

Patented Sept. 27, 1910.

3 SHEETS—SHEET 1.

FIG. 1.

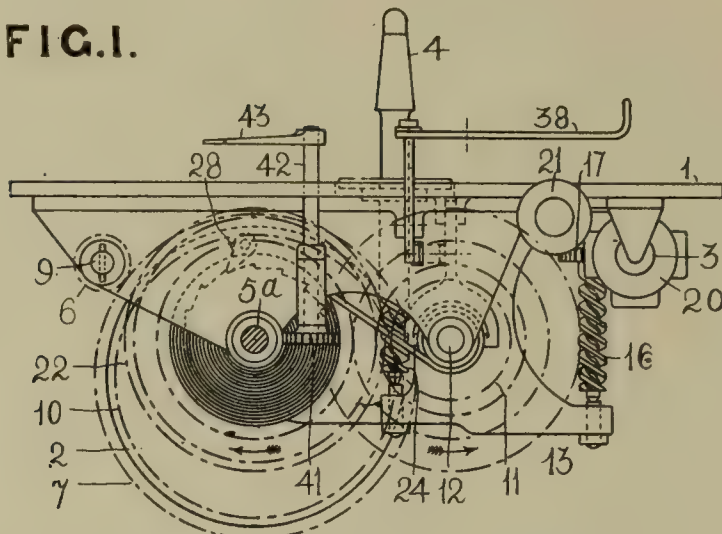
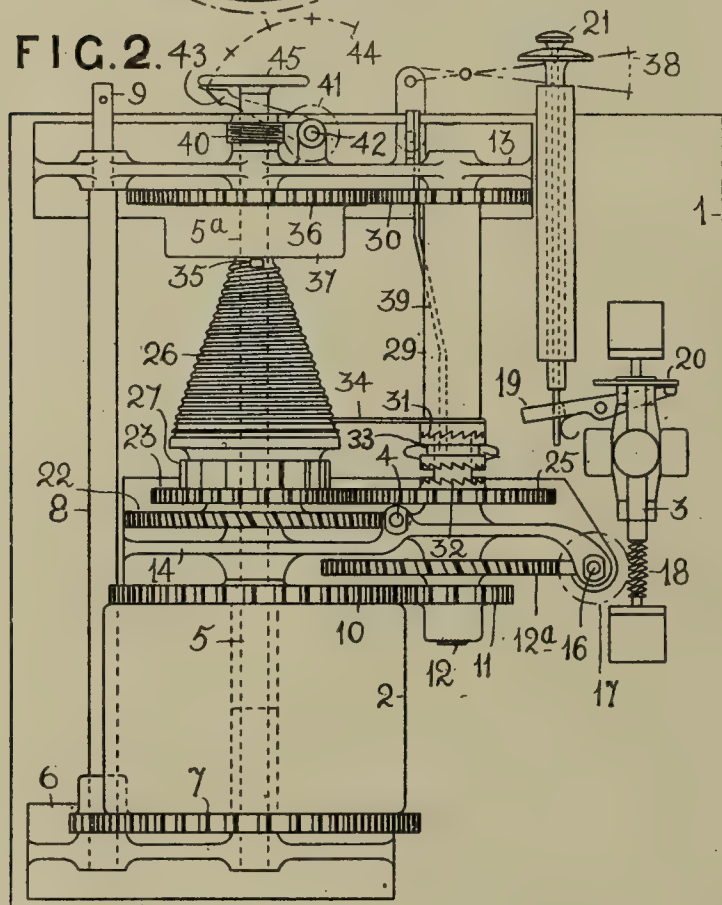


FIG. 2.

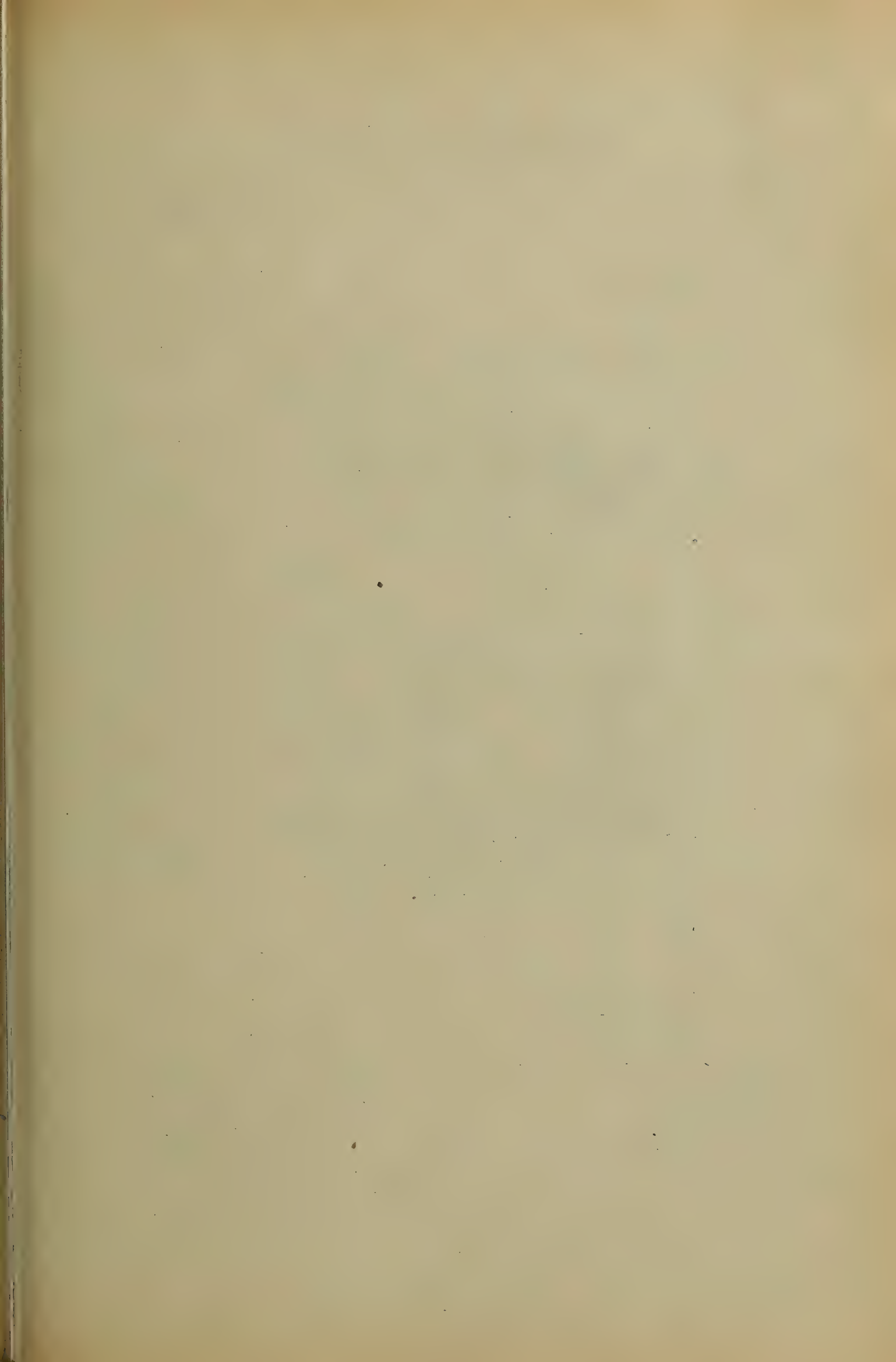


Witnesses:

HC Humburger
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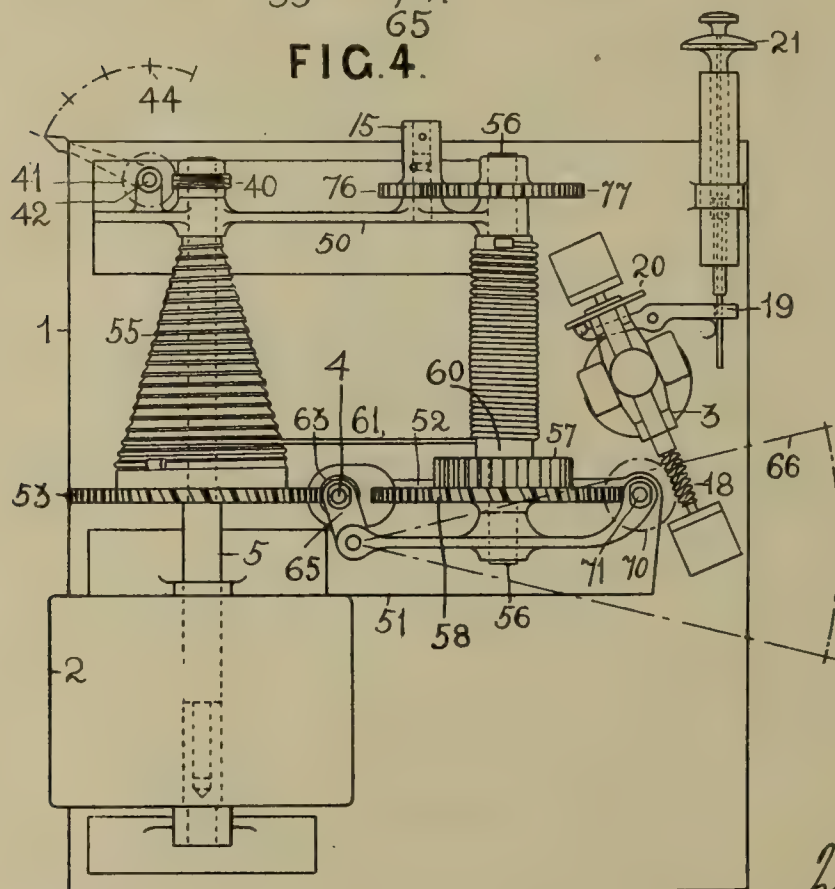
Inventors.

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Charles Ablett
William Edward Lightfoot
by B. Singer atty

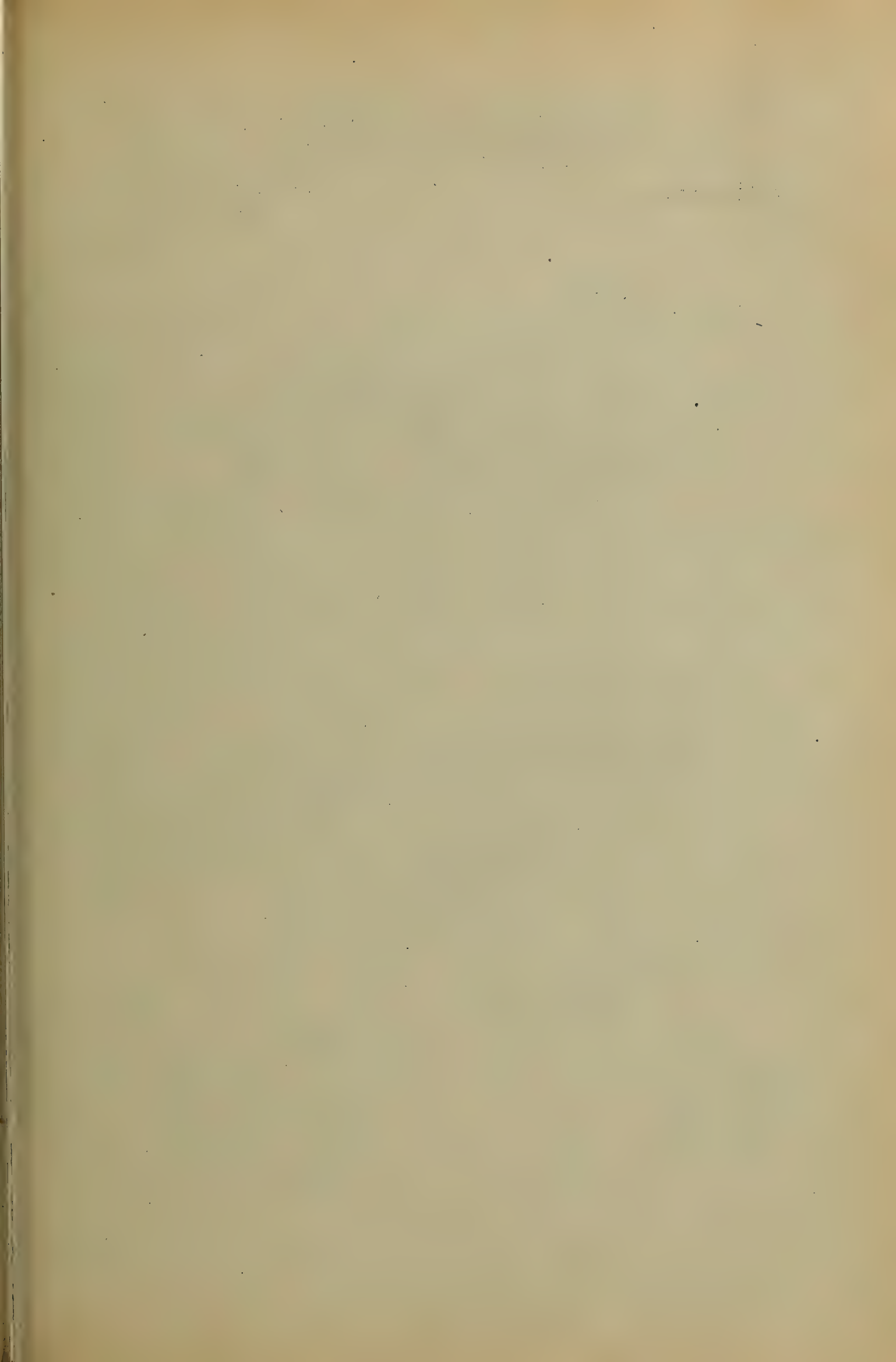


APPLICATION FILED JULY 19, 1909.

3 SHEETS—SHEET 2.



Inventors:
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William Edward Lightfoot
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G. OULTON, C. ABLETT & W. E. LIGHTFOOT.
SOUND RECORDING AND REPRODUCING MACHINE.
APPLICATION FILED JULY 19, 1909.

971,068.

Patented Sept. 27, 1910.

3 SHEETS—SHEET 3.

FIG. 5.

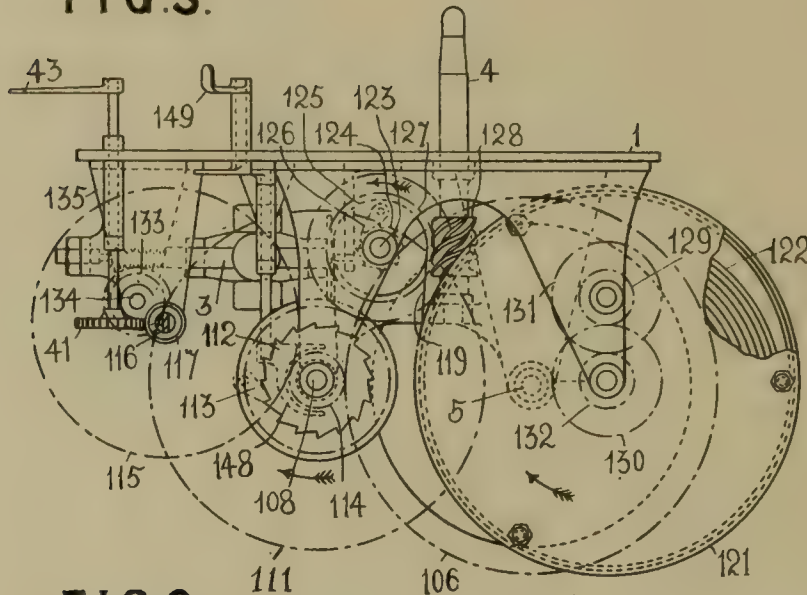
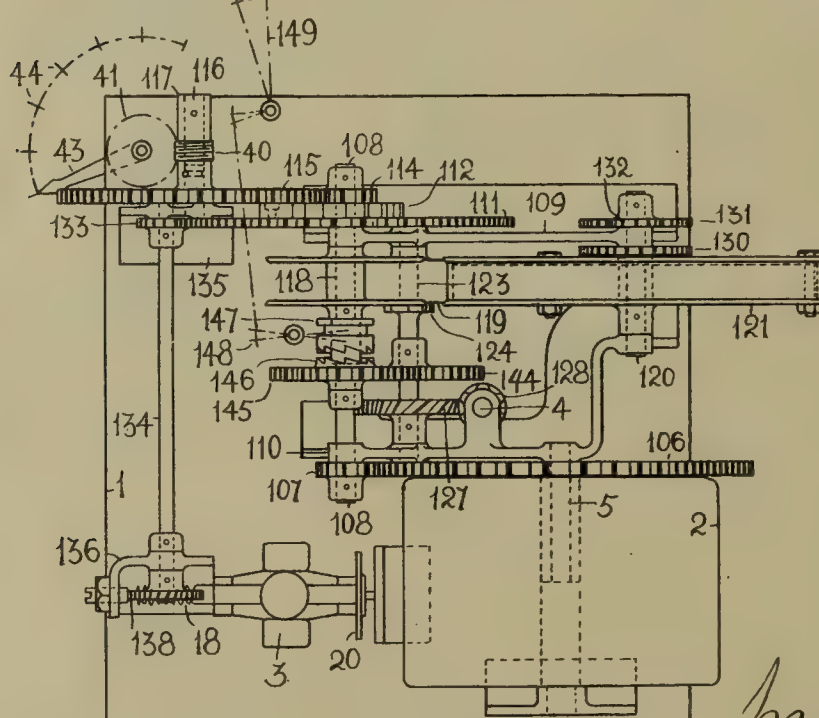


FIG. 6.



Witnesses:

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Inventors:

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Charles Ablett
William Edward Lightfoot
by P. Singer atty

UNITED STATES PATENT OFFICE.

GEORGE OULTON, CHARLES ABLETT, AND WILLIAM EDWARD LIGHTFOOT, OF
LIVERPOOL, ENGLAND.

SOUND RECORDING AND REPRODUCING MACHINE.

971,068.

Specification of Letters Patent. Patented Sept. 27, 1910.

Application filed July 19, 1909. Serial No. 508,519.

To all whom it may concern.

Be it known that we, GEORGE OULTON, CHARLES ABLETT, and WILLIAM EDWARD LIGHTFOOT, subjects of the King of Great Britain and Ireland, residing at Liverpool, in the county of Lancaster, England, have invented new and useful Improvements in Sound Recording and Reproducing Machines, of which the following is a specification.

This invention relates to improvements in or connected with machines for recording and reproducing sounds on flat disks.

The improvements refer to such machines in which the relative surface speed between the stylus and the spiral record line is intended to remain constant so that a symmetrically progressive angular speed of the table in machines in which the record commences at the periphery of the disk, and a symmetrically retrogressive angular speed when the record commences near to the center of the disk is necessary. Hitherto in machines characterized as above stated, the differential speed of the table has been obtained by continuously varying the speed of the centrifugal governor through a friction device or brake in some cases and in others by using a variable speed friction driving gear with a constant speed motor. Neither of these methods has given satisfactory results in practice for a reasonable length of time owing chiefly perhaps to the tendency of surfaces in frictional contact only to slip, especially, as they become worn.

The object of our invention is to overcome the defects of machines in which friction is relied upon to obtain differential driving. As machines both for recording and reproducing only require to work without stopping for a period of time equal to that which is necessary for the longest record, we take advantage of this fact and employ a method of driving which would be unsuitable if the machine had to be continuously driven for an indefinite time without stopping. According to our invention the number of turns of the table and the speed thereof are governed by the length and surface speed of a flexible driving band fixed at one end to a shaft controlled to turn at a constant angular speed and wound thereon with convolutions of symmetrically increasing sizes, the surface speed and motion of the band when being wound on or off the con-

stant speed shaft being transmitted to another shaft which turns the table directly on through gearing.

The accompanying drawings show our improvements embodied in three differently constructed machines for reproducing purposes, the machines being provided with spring motors of the usual kind. Alternatively an electric motor may be used. The attachment for recording purposes is not shown in the drawings as it does not form part of our invention.

Figures 1 and 2 of the drawings represent in elevation and plan looking from underneath, respectively, the mechanism of a sound reproducing machine embodying our improvements. Figs. 3 and 4 represent similar views of a modified construction of the improved machine. Figs. 5 and 6 also represent similar views of another modified construction of the improved machine.

In the several machines illustrated the speed of the table is controlled by the surface speed of a flexible band coiled at one end upon a shaft with convolutions of symmetrically progressing sizes, which band while being coiled or uncoiled with the shaft rotating at a constant speed, travels with a symmetrically varying speed, the variable motion thus obtained being transmitted to the table spindle. Each machine illustrated is also provided with additional gearing so as to enable the table to turn at a constant angular speed and reproduce records made in the ordinary way for a constant speed machine. This additional gearing is provided with suitable clutch mechanism so that it can be thrown in or out at will and the table be driven at a differential or a constant angular speed.

Referring first to Figs. 1 and 2. The motor is governed to turn at a constant speed, and normally, in accordance with our invention it drives the table through the flexible band. The bed plate of the mechanism is represented by 1 the spring box of the motor by 2, the centrifugal governor by 3, the table spindle by 4 and the arbor of the motor or spring box by 5. The motor is wound up through the gear wheels 6 and 7 and the shaft 8, which is adapted at its end 9 to receive a crank (not shown). A spur wheel 10 is fixed on the arbor 5, and this gears into another spur wheel 11 fixed on a shaft 12 mounted in the standards 13 and

14. On the shaft 12 is also fixed a worm wheel 12^a and this gears with a worm spindle 16 carried in the standard 14. A small worm wheel 17 is fixed on the spindle 16, and this gears with a worm 18 formed on the spindle of the centrifugal governor 3. The speed of the motor is regulated in the known way by means of a lever 19 carrying a brake shoe which presses upon the friction disk 20 of the governor, a regulating handle 21 being provided. On a shaft 5^a, eccentrically mounted, in relation to the arbor 5 is loosely mounted a worm wheel 22 and fixed to the wheel 22 is a spur wheel 23. The worm wheel 22 gears with a worm 24 fixed on the table spindle 4 and the spur wheel 23 gears with another spur wheel 25 loose on the shaft 12. Fixed to the shaft 5^a is a fusee or grooved cone 26, to the large end of which is fixed a ratchet wheel 27 which is engaged by a spring pressed pawl 28, pivoted to the wheel 23. A barrel 29, is loosely mounted on shaft 12 and is provided with a spur wheel 30 fixed at one end and a clutch member 31 at the other end. The spur wheel 25 has also a similar clutch member 32 formed on its boss. On the shaft 12 is a sliding clutch member 33 adapted to engage with either members 31 or 32 so that either the wheel 25 or the barrel 29 can be turned by the shaft 12. One end of a flexible band 34 is fixed to the barrel, and the rest of the band is wound around the fusee 26, the other end of the band being fixed to the latter at 35. Fixed on the shaft 5^a is a spur wheel 36 which is geared with the wheel 30, and a spring box 37 is formed on the wheel 36 and carries a coil spring not shown in the drawing, one end of the spring being fixed to the shaft 5^a and the other to the box 37. The clutch sliding member 33 is actuated by a lever 38 and rod 39.

An indicating device to insure the correct starting speed for records of different diameters consists of a worm 40 fixed at the end of the shaft 5^a and this gears into a worm wheel 41 fixed on a vertical spindle 42 carrying a pointer 43. A dial plate not shown in the drawing, is marked as shown, at 44, to indicate different sizes of records. When the band 34 is fully wound on the fusee 26, as shown in the drawing, the pointer indicates the largest sized record that the machine will reproduce. For lesser sizes of records, the band would be wound on to the fusee up to the point indicated on the dial plate by the pointer and representing the particular size of record. As the record is being reproduced, the pointer recedes on the dial plate. When the band is all wound upon the drum, in order to reproduce another record, it is necessary to rewind the band on to the fusee. A small hand wheel 45 fixed on the end of the shaft 5^a is provided for this purpose.

When the machine is being used with records which require a differential speed of the table, the clutch member 33 is engaged with the barrel 29 and the motor winds the band 34 on to the barrel 29 from off the fusee 26 turning this around at a symmetrically progressive speed. The pawl 28 being engaged with the ratchet wheel 27 the wheel 23 turns this wheel 25 around idly and the worm wheel 22 drives the table spindle 4 through the worm 24. The coil spring in the spring box 37 keeps an even tension on the band 34 by braking the fusee 26. When the clutch member 33 is engaged with the wheel 25, the table spindle 4 is driven at a constant angular speed by the motor through the shaft 12, wheels 25 and 23 and the worm wheel 22 and worm 24. When the machine is not intended also for ordinary records, the wheels 23 and 25 and the clutch 33 are dispensed with. The pawl 28 would then be pivoted to the screw wheel 22.

Referring now to Figs. 3 and 4. In the machine hereby illustrated, the motor is geared directly to the table spindle and is controlled to turn at a differential speed by a governed constant speed shaft, and the surface speed of a flexible band spirally wound thereon when being drawn off or uncoiled. In the Figs. 3 and 4 the bed plate of the mechanism is represented by 1, the spring box of the motor by 2, the centrifugal governor by 3, the table spindle by 4, and the arbor of the motor or spring box by 5. On the arbor 5, which is carried in bearings in the standards 50 and 51, is fixed a screw wheel 53 and a cone or fusee 55 having a spiral groove running around from one end to the other. Parallel with the arbor 5, another shaft 56 is mounted in bearings in the standards and has a ratchet wheel 57 fixed thereto. Another screw wheel 58 is loosely mounted on the shaft 56 and provided with a pawl 59 pivoted thereto and engaging with the teeth of the ratchet wheel 57. To the ratchet wheel 57 is fixed a drum or barrel 60 opposite to the fusee 55. To the large end of the fusee is fixed one end of a cord or chain preferably a thin wire cable represented by 61, the other end of the cable being fixed to the barrel 60 opposite to the small end of the fusee and the cable being long enough to wrap around the fusee for its full length and pass over to the barrel as well. When the motor is wound up fully, or when the largest sized record the machine can accommodate is to be used, the fusee is empty and all the cable is wound up on the barrel. The gear employed in this machine between the motor and the table spindle and through which the latter is turned, preferably consists of a screw or worm 63 fixed to the table spindle 4 and this may engage with either the screw wheel 53 or 58. The table spindle 4 is mounted in a bracket 65 which is adapt-

ed to swivel so that the worm 63 may be dis-
engaged at will from the wheel 53 and be
engaged with the wheel 58, a lever such as
66 being provided for this purpose. The
5 table spindle 4 may alternatively be mount-
ed in a fixed bearing in gear only with the
wheel 53. In this case ordinary records
could not be used. The shaft 56 being a
constant speed shaft, when the worm 63 is
10 engaged with the wheel 58, the table spindle
will turn at a constant angular speed and
thus ordinary records can be used. The
shaft 56 is controlled so as to rotate at a
constant speed by means of the centrifugal
15 governor 3 and this is driven by screw gear-
ing from the wheel 58. The governor spin-
dle has a worm 18 cut thereon with which
engages a worm wheel 70 fixed on a spindle
71. The latter has also a worm 72 cut there-
20 on and this engages with the wheel 58. The
ordinary speed regulator acting upon the
governor disk 20 is represented by the lever
19 and the handle 21. The motor is wound
up by turning the shaft 56. The handle is
25 preferably fitted to a separate spindle 75 on
which is fixed a gear wheel 76. The latter
gears into another gear wheel 77 fixed to
the shaft 56.

An indicator is provided to enable the cor-
30 rect starting speed for a record of any given
diameter to be assured. This consists pref-
erably of a dial plate and a pointer geared
to the motor so as to make not more than a
revolution while the machine is running
35 through the largest record. On the end of
the fusee we fix a worm 40 and on a vertical
spindle 42 a worm wheel 41, the pointer 43
being fixed to the spindle 42. The dial plate
is marked as indicated at 44 to correspond
40 with the different sized records which may
be used, and when the machine has been run
down and a record of a certain size is re-
quired to be used next, the machine is wound
up until the pointer comes opposite the
45 mark referring to the particular size of
record.

In the machine illustrated in Figs. 5 and
6, the motor shaft is geared to the table
spindle and controlled by a centrifugal gov-
50 ernor to work at a constant speed and a flat
flexible band is employed in which the con-
volutions are formed one over the other.

The bed plate of the mechanism is repre-
sented by 1, the spring box of the motor by
55 2, the centrifugal governor by 3, the table
spindle by 4, and the arbor of the motor or
spring box by 5. On the arbor 5 is fixed a
spur wheel 106 which gears into a pinion
107 fixed on a shaft 108 mounted in bear-
60 ings in the standards 109 and 110. The shaft
108 also carries a large spur wheel 111 loose
thereon and close to it a ratchet wheel 112
fixed on the shaft. On the wheel 111 is piv-
oted a pawl 113 and this engages with the
65 ratchet teeth of the wheel 112 a spring, not

shown, pressing the pawl into engagement
with the teeth. There is also a pinion 114
fixed on the end of the shaft 108 and into
this gears a spur wheel 115 mounted on a
stud 116, the boss 117 of the wheel being
70 adapted to receive a crank for winding up
the motor. While the motor is being wound
up, the spur wheel 111 remains stationary
owing to the pawl 113 riding over the teeth
of the ratchet wheel 112, the direction of the
75 winding being opposite to that indicated
by the arrows.

Upon the shaft 108 is fixed a spool or
drum 118 to which one end of the flexible
band 119 is fixed and upon which it is
80 wound as the motor turns the table. On
another shaft 120 carried by the standards
109 and 110 is fixed another spool or drum
121 to which the other end of the band 119
is fixed and upon which it is wound before
85 a record is commenced. Inside the spool 121
is a coil tension spring 122 against the re-
sistance of which the band is uncoiled from
the spool and by which the band is rewound
on the spool when the motor is being wound
90 up and the possibility of the band becoming
slack while being drawn off is obviated.
Upon a shaft 123, also carried by the stand-
ards 109 and 110, is fixed a ratchet wheel
124 and loose upon the shaft 123 is mounted
95 a driving pulley wheel 125 pivoted to which
is a spring pressed pawl 126. The pulley is
in line with the spools 118 and 121 and the
band 119 passes partly round the pulley
from one spool to the other. Upon the shaft
100 123 is also fixed a worm wheel 127 which
gears with a worm 128 fixed on the table
spindle 4. Thus the band 119 can be wound
back on to the spool 121 from the spool 118
without turning the shaft 123 or the table
105 spindle 4 as the pawl 126 will ride over the
teeth of the ratchet wheel 124. As the
spring 122 requires only about one fourth
the number of turns to wind it up that spool
121 makes, a reducing gearing of known con-
110 struction is interposed between the spindle
of the spring 122 and the spool 121. This
gear is indicated by the wheels 129, 130,
131 and 132.

The centrifugal governor 3 is driven from
115 the motor through the spur wheel 111 which
gears into a pinion 133 fixed on a shaft 134
carried in brackets 135 and 136. The gov-
ernor 3 has a worm 18 fixed on its spindle
into which gears the worm wheel 138 fixed
120 on the shaft 134. While the motor is being
wound up, owing to the wheel 111 being free
to turn idly in one direction, the governor re-
mains stationary.

Assuming that this machine starts at the
125 proper speed for any given size of record,
the indicator provided for this purpose con-
sists of the pointer 43 and a dial plate
marked, as indicated at 44, each mark repre-
senting a record of a certain diameter, the
130

pointer 43 being geared in this case to the wheel 115 by means of a worm 40 fixed on the boss thereof which gears into a worm wheel 41 fixed on the spindle 42 of the pointer. The pointer in the position indicated represents that the spool 121 is wound up for the largest size record that the machine will play. If the record to be used is a smaller one, the boss 117 will be turned around by the handle so as to wind off the spool 118 a sufficient length of the band for and to turn the pointer around until it indicates the mark corresponding to the size of the record to be used.

For the purpose of enabling the table in this machine to turn at a constant speed so that records made in the ordinary way can be used, we arrange that the table spindle 4 can be directly coupled up to the motor without the band 119 effectively acting, the latter merely running idly during the time. This adjustment can be obtained by fixing a spur wheel 144 on the shaft 123 and loosely mounting another spur wheel 145 on the shaft 108 gearing with the wheel 144. The wheel 145 is provided with a clutch jaw 146 and a sliding clutch jaw 147 is fixed so as to turn with and on the shaft 108. A shipping lever 148 is provided to close these jaws together or to separate them as required and a handle indicated by 149 may be mounted in any suitable position to actuate the lever 148.

The clutch is preferably provided with inclined toothed jaws so that it would force itself out of engagement in the event of the machine being run beyond a certain limit when the speed of the band would more than equal the surface speed of the pulley 125 owing to the convolutions of the band on the spool 118 increasing in size.

The retarding or stopping device in the form of a brake acting on the friction disk 20 of the governor in the known way is not shown in the drawing.

What we claim as our invention and desire to secure by Letters Patent of the United States is:—

1. Driving mechanism for sound recording and reproducing machines comprising in combination, a record operating spindle, a motor, a constant speed shaft member, a revoluble body having convolutions of symmetrically increasing size for driving said spindle, and a flexible element trained about said body and shaft member whereby a symmetrically variable speed of a limited number of revolutions is imparted to said spindle.

2. Driving mechanism for sound recording and reproducing machines comprising in combination, a record carrying spindle, a motor, a constant speed shaft driven from said motor, a member having a gradually increasing peripheral surface geared to said

spindle, and a flexible element trained about said member and constant speed shaft for imparting a limited number of revolutions to said spindle at a constantly varying speed.

3. Driving mechanism for sound recording and reproducing machines comprising in combination, a record carrying spindle, a motor, a constant speed shaft driven from said motor, a flexible element adapted to be wound and unwound on said shaft, and mechanisms operated by said element for imparting a limited number of revolutions to said spindle at a constantly varying speed.

4. Driving mechanism for sound recording and reproducing machines comprising in combination, a record carrying spindle, a motor, a constant speed shaft driven from said motor, a flexible element adapted to be wound and unwound on said shaft, mechanisms operated by said element for imparting a limited number of revolutions to said spindle at a constantly varying speed, and means for connecting said spindle with said motor for operating the former at a constant speed.

5. Driving mechanism for sound recording and reproducing machines comprising in combination, a record carrying spindle, a motor, a constant speed shaft driven from said motor, a member having a gradually increasing peripheral surface geared to said spindle, a flexible element trained about said member and constant speed shaft for imparting a limited number of revolutions to said spindle at a constantly varying speed, and means for connecting said spindle with said motor for driving the former at a constant speed.

6. Driving mechanism for sound recording and reproducing machines comprising in combination, a record carrying spindle, a motor geared to said spindle, a shaft, a governor for rendering the speed of said shaft constant, gearing connecting said shaft with said motor, and mechanism including a flexible element for operating said spindle, said element being wound about said shaft for operating and controlling the speed of said spindle through said mechanism.

7. Driving mechanism for sound recording and reproducing machines comprising in combination, a record carrying spindle, a motor geared to said spindle, a shaft driven from said motor, a governor for rendering the speed of said shaft constant, mechanism including a flexible element for operating said spindle, said element being wound about said shaft for operating the spindle through said mechanism, and means for connecting said spindle for direct operation from said motor and rendering said mechanism and element inoperative or rendering said mechanism and element operative and throwing said spindle out of direct driving connection with said motor.

8. Driving mechanism for sound recording and reproducing machines comprising in combination, a record carrying spindle, a motor, a shaft driven by said motor, a governor for rendering the speed of said shaft constant, and mechanism coacting with and including a flexible element connected with said shaft for imparting a limited number of revolutions to said spindle at a constantly and symmetrically varying speed.

9. Driving mechanism for sound recording and reproducing machines comprising in combination, a record carrying spindle, a motor, and two rotating members and a flexible element operatively connecting the same for driving said spindle, one member being driven from said motor and governed to rotate at a constant speed, the other of said members being constructed and arranged to receive said element about its periphery and impart a limited number of revolutions to said spindle at a varying speed during the travel of said element about said member.

10. Driving mechanism for sound recording and reproducing machines comprising in combination, a record carrying spindle, a motor, a constant speed shaft operated by said motor, a rotating member having a gradually and symmetrically reduced periphery and connected to drive said spindle, a cord or cable arranged to be wound and unwound on said member and shaft to impart a limited number of revolutions to said spindle at a constantly varying speed, and means for indicating the starting speed for records of different sizes.

11. Driving mechanism for sound record-

ing and reproducing machines comprising in combination, a record carrying spindle, a motor, a constant speed shaft operated by said motor, a rotating member having a gradually and symmetrically reduced periphery and connected to drive said spindle, a cord or cable arranged to be wound and unwound on said member and shaft to impart a limited number of revolutions to said spindle at a constantly varying speed, and means operated by said member for indicating the starting speed for records of different sizes.

12. Driving mechanism for sound recording and reproducing machines comprising in combination, a record carrying spindle, a motor, a constant speed shaft operated by said motor, a rotating member having a gradually and symmetrically reduced periphery and connected to drive said spindle, a cord or cable arranged to be wound and unwound on said member and shaft to impart a limited number of revolutions to said spindle at a constantly varying speed, means for winding said cord or cable on said member prior to reproducing a record, and means operated by said member for indicating the starting speed for records of different sizes.

In testimony whereof we have signed our names in the presence of two subscribing witnesses.

GEORGE OULTON.

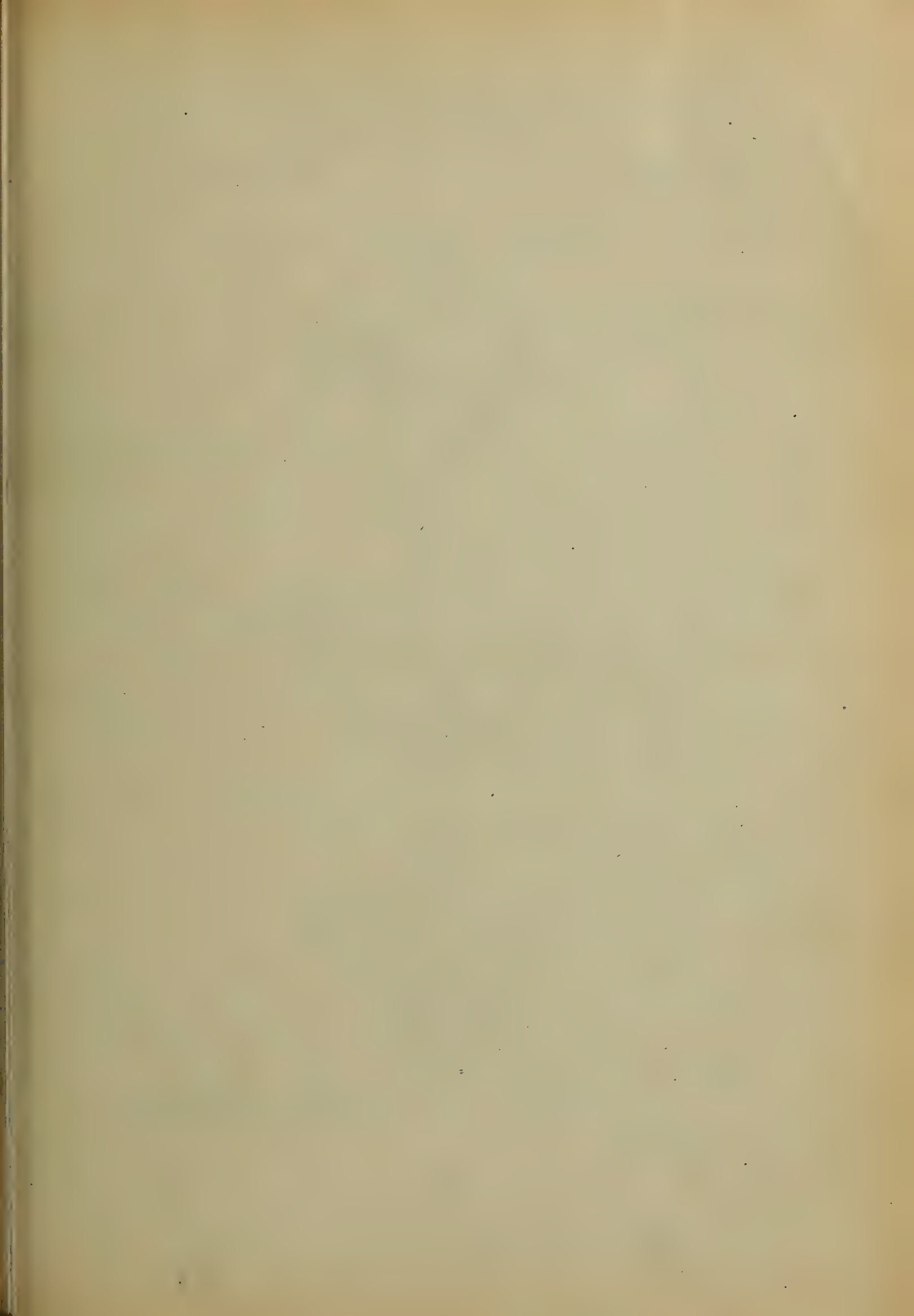
CHARLES ABLETT.

WILLIAM EDWARD LIGHTFOOT.

Witnesses:

THOMAS DUTTON EVANS,

RIDLEY JAMES URQUHART.



L. GRIFFITH.
SOUND REPRODUCING DEVICE FOR TALKING MACHINES.
APPLICATION FILED MAR. 2, 1910.

971,442.

Patented Sept. 27, 1910.

Fig. 1.

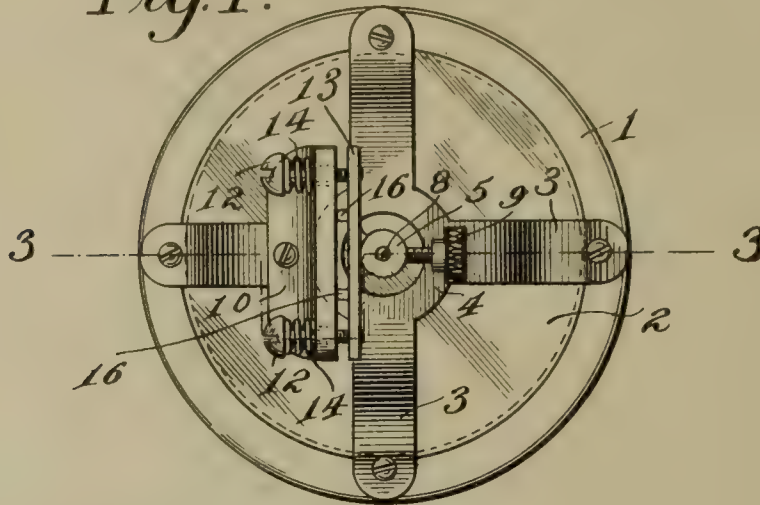


Fig. 2.

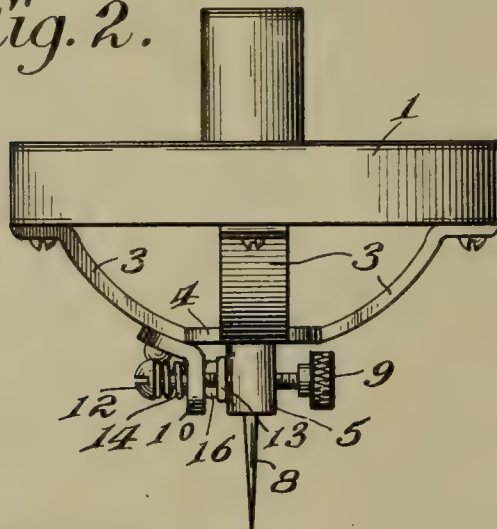
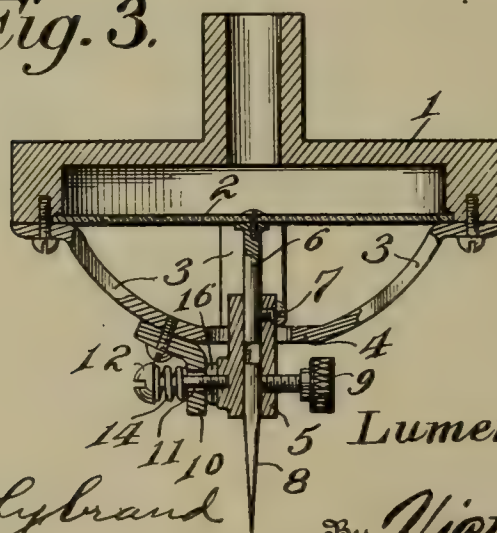


Fig. 3.



Inventor

Lumen Griffith

Witnesses

Horace H. Lybrand

B. Bradway.

By Victor J. Evans

Attorney

UNITED STATES PATENT OFFICE.

LUMEN GRIFFITH, OF HUDSON, MICHIGAN.

SOUND-REPRODUCING DEVICE FOR TALKING-MACHINES.

971,442.

Specification of Letters Patent. Patented Sept. 27, 1910.

Application filed March 2, 1910. Serial No. 546,831.

To all whom it may concern:

Be it known that I, LUMEN GRIFFITH, a citizen of the United States, residing at Hudson, in the county of Lenawee and State of Michigan, have invented new and useful Improvements in Sound-Reproducing Devices for Talking-Machines, of which the following is a specification.

This invention relates to a sound reproducing device for talking machines and has for its principal object to provide a novel supporting means for the record needle or stylus and to so operatively connect such needle with the diaphragm of the sound box that a superior reproduction of sounds is possible.

Another object of the invention is to provide an extremely simple, practical and durable device of this character of such design that the parts are interchangeable and are so delicately adjusted and positioned that the records can be made finer in vibrating lines and perfect natural tones reproduced, and at the same time the weight borne by the record from the stylus or needle will be lessened with the result that the scratching sounds will be practically eliminated.

With these objects in view, and others as will appear as the description proceeds, the invention comprises the various novel features of construction and arrangement of parts which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawing, which illustrates one embodiment of the invention; Figure 1 is a plan view of the sound reproducing device. Fig. 2 is a side view thereof; and Fig. 3 is a section on line 3—3, Fig. 1.

Similar reference characters are employed to designate corresponding parts throughout the several views.

Referring to the drawing, 1 designates the sound box in which is supported the usual diaphragm 2 and attached to the box at the diaphragm side thereof is a supporting spider or frame 3 which has a hub 4 in which is loosely disposed a sleeve coupler or socket piece 5. The inner end of this coupler 5 receives the diaphragm needle 6, the connection being effected by a set screw 7. In the opposite end of the coupler is inserted the stylus or record needle 8, which is removably secured in place by a milled-headed screw 9. The needles 6 and 8 are disposed

in alinement and at right angles to the diaphragm 2, and the needle 8 will engage the record in radial or perpendicular relation thereto so that the vibration will be communicated to the diaphragm line from the record and longitudinally of the needles and coupler.

The coupler is mounted on the spider or frame 3 by means of a bracket 10 which has openings 11 through which loosely pass screws 12, the same passing through lugs or ears 13 extending from opposite sides of the coupler, and on the screws are stiff springs 14 that are held between the bracket 10 and the heads 15 of the screws and their tension can be adjusted by turning the screws. The coupler is spaced from the bracket by means of spaced projections 16 which engage the opposed face of the bracket and by mounting the coupler in this manner, it can move longitudinally in communicating the vibrations from the records to the diaphragm.

From the foregoing description taken in connection with the accompanying drawing, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention relates, and while I have described the principle of operation of the invention, together with the device which I now consider to be the best embodiment thereof, I desire to have it understood that the device shown is merely illustrative and that such changes may be made when desired as are within the scope of the claims.

What I claim as new and desire to secure by Letters Patent is:—

1. The combination of a sound box, a diaphragm mounted thereon, a spider secured to the sound box and located at the side of the diaphragm opposite from the sound box, said spider having an opening arranged in line with the center of the diaphragm, a member having one end operatively related to the diaphragm, a tubular coupler extending through the opening of the spider and spaced from the edges of said opening, one end of the member extending into the coupler, means for securing the coupler and member together, a needle secured in the other end of the coupler, a bracket on the spider, members loosely mounted on the bracket and connected with the coupler, and springs on the last-mentioned members for yieldingly mounting the coupler.

2. The combination of a sound box, a dia-

phragm mounted thereon, a spider secured to the sound box and located at the side of the diaphragm opposite from the sound box, said spider having an opening arranged in
5 line with the center of the diaphragm, a member having one end operatively related to the diaphragm, a tubular coupler extending through the opening of the spider and spaced from the edges of said opening, one
10 end of the member extending into the coupler, means for securing the coupler and member together, a needle secured in the other

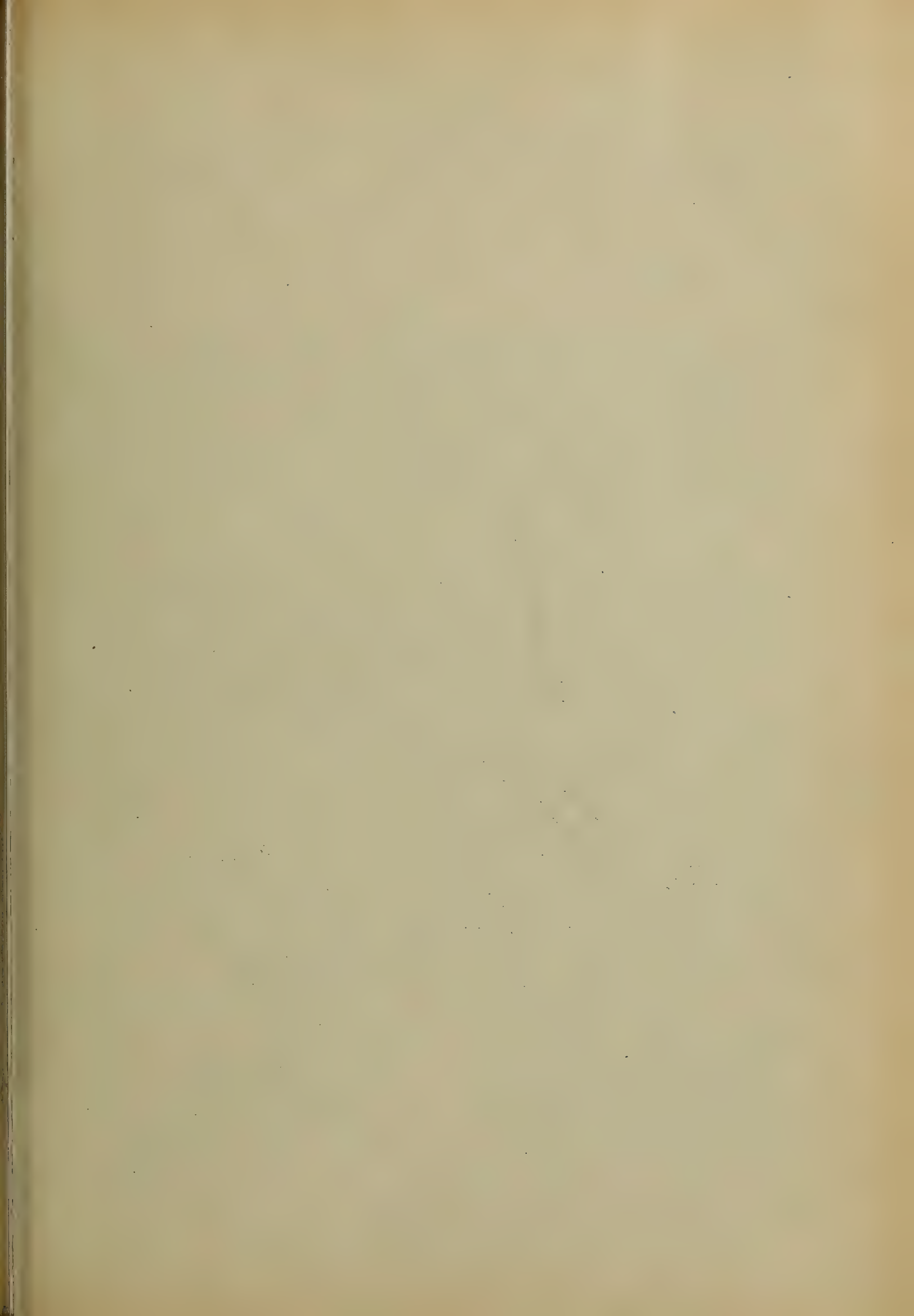
end of the coupler, a bracket on the spider having spaced elongated openings, screws extending through the openings engaged 15 with the coupler, and springs surrounding the screws and having their ends bearing on the heads of the latter and on the bracket.

In testimony whereof I affix my signature in presence of two witnesses.

LUMEN GRIFFITH.

Witnesses:

G. I. THOMPSON,
A. M. VOORHIES.



E. A. LEET.
HORN.

APPLICATION FILED JAN. 4, 1910.

972,003.

Patented Oct. 4, 1910.

Fig. 1.



Fig. 4.

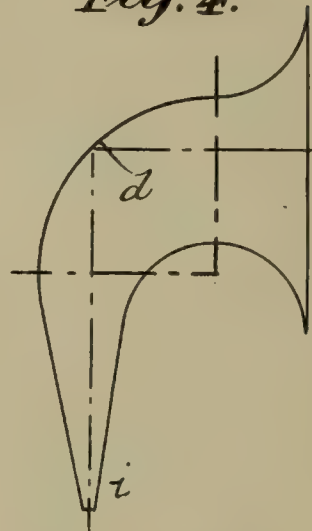


Fig. 2.

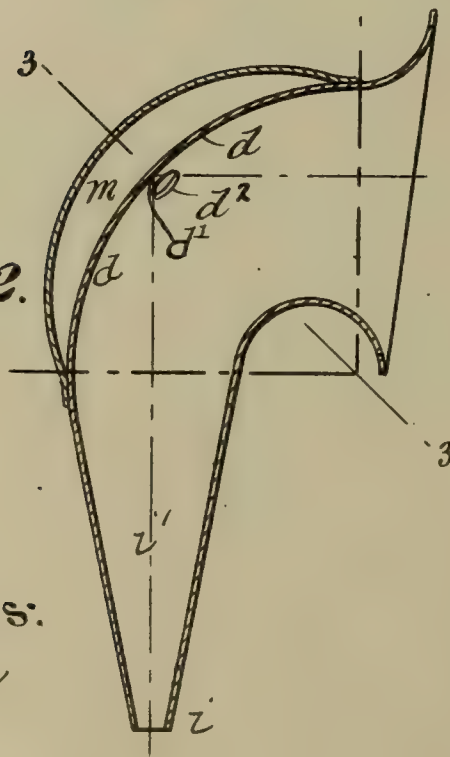
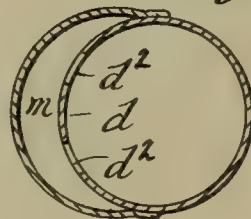


Fig. 3.



Witnesses:
Alfred
Gardner
Gardner

Inventor:
Edward A. Leet
By his Attorney
Geo. Williams

UNITED STATES PATENT OFFICE.

EDWARD A. LEET, OF NEW YORK, N. Y.

HORN.

972,003.

Specification of Letters Patent.

Patented Oct. 4, 1910.

Application filed January 4, 1910. Serial No. 536,277.

To all whom it may concern:

Be it known that I, EDWARD A. LEET, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Horns, of which the following is a specification.

My improvements relate to the configuration of sound transmitting horns and are applicable to various uses, particularly for use in connection with phonographs, gramophones and similar instruments, and are designed to obviate "interference" and harshness, and to modulate and blend the various notes and tones in transit.

The invention consists in the specific construction and arrangement of parts shown, described and claimed, distinguishing features being a concave deflecting surface which is essentially a quadrantal segment in central longitudinal section, situated obliquely opposite the inlet passage with the axial line of the latter in coincidence with the center of said deflecting surface; and in a modulating chamber situated back of and coinciding with said concave deflecting surface, substantially as hereinafter set forth, said modulating chamber being formed with one or more openings through the anterior deflecting surface which perform the same function that the nasal passages do for the human throat by increasing resonance and relieving and obviating all tendency to muffle the sound. In fact the modulating chamber and its openings through the anterior deflecting surface may be likened to the nasal cavities in that they increase resonance while rendering the timbre more clear and distinct, at the same time neutralizing and counteracting stiffness and harshness emanating from the metallic diaphragm of a phonograph or other source of sound vibration.

In the accompanying drawings, Figure 1, is a side elevation of a horn embodying my invention; Fig. 2, a central vertical section thereof. Fig. 3, is a section on plane of line 3—3 Fig. 2; Fig. 4, a diagram illustrating a modification.

As before intimated my invention is applicable to sound transmitting horns for numerous purposes, and I do not limit myself

in this respect although I have herein for convenience of illustration, shown it as adapted to a gramophone or phonograph horn.

What I designate as the concave deflecting surface d , forming the upper back portion of the horn is of peculiar construction in that in central longitudinal section, as shown in Fig. 2, it presents a quadrantal segment of a circle, disposed diagonally opposite the inlet i , the longitudinal axial line i' , of which coincides with the center d' , of the segment d .

I have found by investigation and experiment that this configuration and arrangement of deflecting surface with relation to the inlet affords the best practical results, the "interference" or confusion of sounds and tones being reduced to the minimum, and the transmission being clear and distinct.

I still further improve the quality of tone and render it more natural and uniform by the use of a modulating chamber m , behind the concave deflecting surface d , thereby eliminating the hard and harsh metallic sound emanating from the diaphragm when the horn is used on a phonograph, for instance, and hence eliminating one of the principal objections to the use of such instruments.

One or more openings d^2 , may be made through the anterior deflecting surface d , into the modulating chamber m , thereby increasing the resonance, as well as the clearness and softness of timbre, and rendering the device analogous to the human throat and nasal cavities in the control and modulation of the sound vibrations received through the inlet passage i .

In fact by the use of my improved horn I attain a full clear volume of sound in which the various notes are blended harmoniously, and in which hard metallic sounds are modulated and neutralized.

What I claim as my invention and desire to secure by Letters Patent is,

A horn for transmitting sound vibrations formed with a concave deflecting surface disposed diagonally opposite the inlet, said concave deflecting surface presenting in central longitudinal section a quadrantal seg-

ment of a circle, the center of the quadrantal
segment coinciding with the axial line of the
inlet passage, said horn being also formed
with an external modulating chamber eccen-
5 tric to and covering the whole of said con-
cave quadrantal deflecting surface, said de-
flecting surface being also formed with an

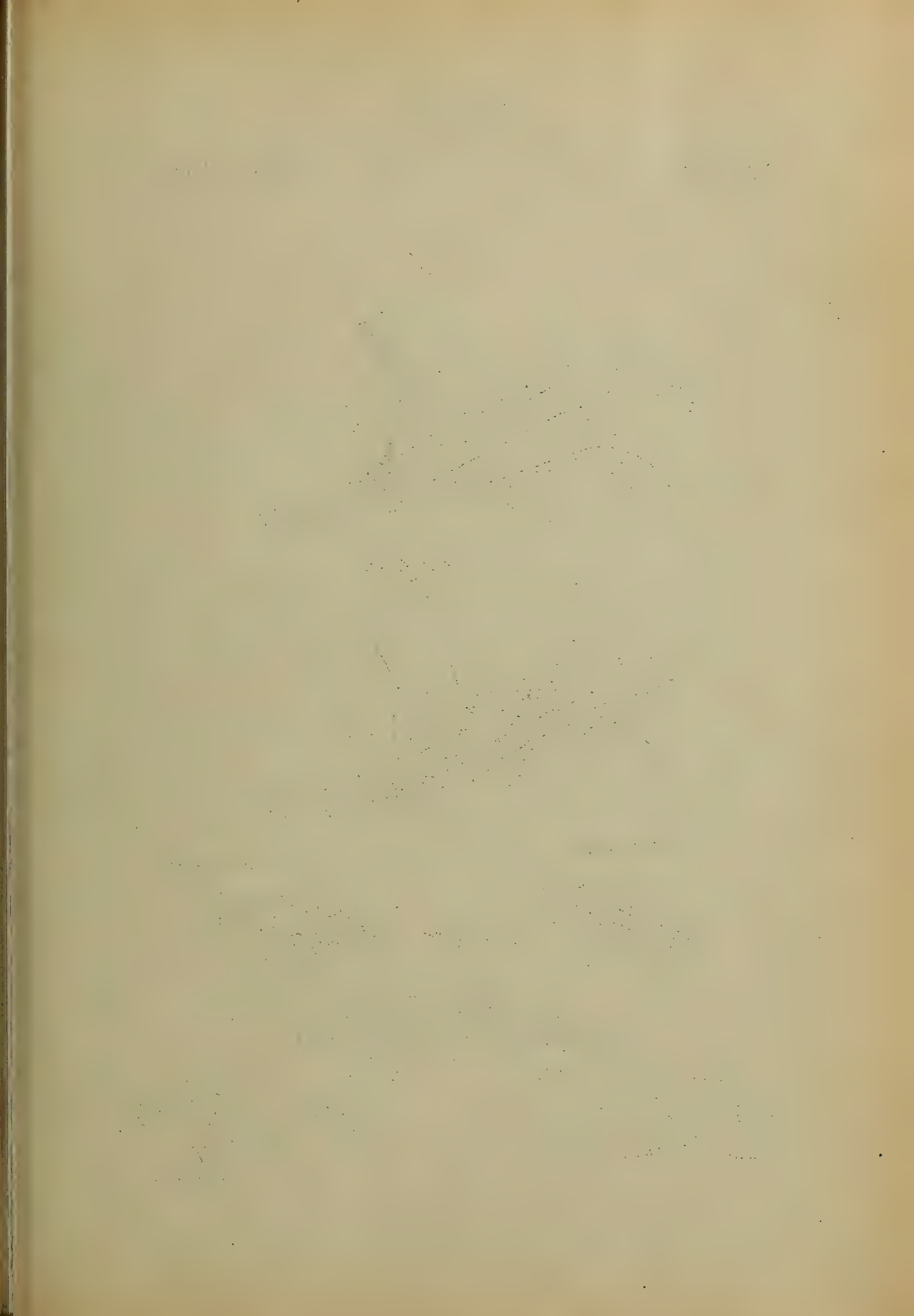
opening into the modulating chamber on
each side of the axial line of the inlet pas-
sage, for the purpose described.

EDWARD A. LEET.

Witnesses:

D. W. GARDNER,

GEO. WM. MIATT.



972,013.

Patented Oct. 4, 1910.

Fig. 1

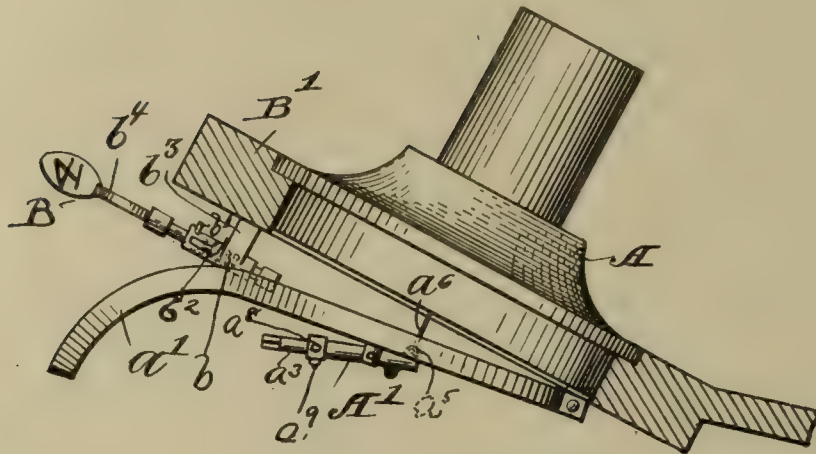


Fig. 2

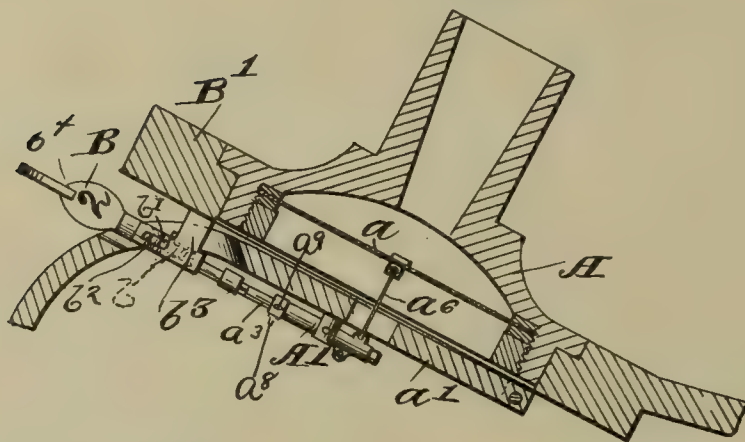


Fig. 4

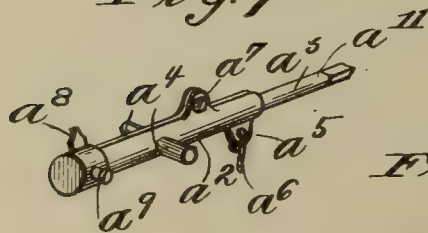


Fig. 3

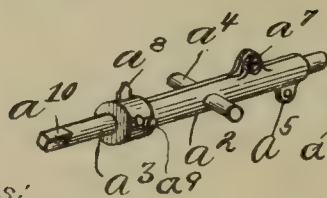


Fig. 5

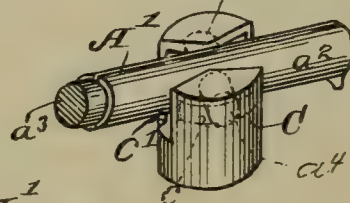
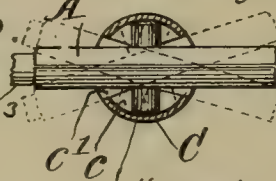


Fig. 6



Witnesses:

J. C. Turner
 Jno. F. Oberlin

Inventor:

Harry B. McNulty
 by J. B. Fay
 Attorney.

UNITED STATES PATENT OFFICE.

HARRY B. McNULTY, OF EAST CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNITED STATES PHONOGRAPH COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

PHONOGRAPH-REPRODUCER.

972,013.

Specification of Letters Patent.

Patented Oct. 4, 1910.

Application filed January 28, 1909. Serial No. 474,835.

To all whom it may concern:

Be it known that I, HARRY B. McNULTY, a citizen of the United States, and a resident of East Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Phonograph-Reproducers, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle so as to distinguish it from other inventions.

The object of the invention is the provision of a reproducer for use in a phonograph intended to optionally play upon records having 100 and 200 threads to the inch, respectively, or as they are currently known, "two-minute" and "four-minute" records. The subject matter of this application, it should further be explained, has in the main been divided out of my co-pending application filed November 9, 1908, Serial No. 463,942, wherein such reproducer is shown in conjunction with suitable mechanism for automatically adjusting the same for the two uses in question.

Said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawing: Figures 1 and 2 are partly sectional and partly side elevational views of a reproducer embodying the improvements in question, with the stylus lever shown in operative and inoperative position, respectively; Fig. 3 is a perspective view of the stylus lever of such reproducer; Fig. 4 is a similar perspective view of a slightly modified form of such stylus lever; and Figs. 5 and 6 are respectively a perspective view and a transverse section of a stud or pin for supporting the stylus lever on the floating weight of the reproducer.

The general features of construction entering into my improved reproducer, will require to be only briefly noted, consisting as they do of a body A of familiar form wherein is held the usual diaphragm a , and to

which is pivotally attached the floating weight a' . On the latter is in turn mounted the stylus lever A' . It is to the construction of the stylus lever, and to the manner in which it is mounted upon the floating weight, that attention is more particularly desired in the present connection.

Referring to Fig. 3, lever A' will be seen to consist, instead of the usual bar, of a sleeve a^2 within which is rotatably held a pin a^3 , that constitutes the stylus holder proper. Suitable means, as a transverse pivot pin a^4 and an eye a^5 , are provided for attaching the sleeve to the plate a' and to the link a^6 , respectively. This sleeve is longitudinally split and provided with an adjusting screw a^7 adapted to secure the pin a^3 more or less tightly therein, as desired. At its outer end such pin or rotatable portion a^3 of the lever is provided with two sapphires a^8 a^9 that constitute the styluses proper, and contact with the record when the reproducer is in use. Such styluses are disposed at substantially right angles to each other about the axis of the pin or holder, and are respectively adapted for the fine and coarse line records. Obviously in one angular position of the holder about its axis, the one stylus is brought into operative position, while, in another position of such holder, the other stylus is thus disposed.

Styluses a^8 a^9 are not located at the extreme end of the pin, or holder in the specific structure shown in Fig. 3, but such holder projects a short distance therebeyond and is squared, as at a^{10} , so as to permit engagement therewith of a key B that is mounted on the under side of the annular holder B' wherein the reproducer is seated, being movable longitudinally in a line with the stylus holder a^3 when the latter is in its raised, inoperative position shown in Fig. 2. A spring b normally holds the key B out of engagement with the holder but it may be readily moved inwardly and thereupon rotated in one direction or the other to effect a corresponding variation in the axial position of the styluses. Such rotation is limited by a pin b' on the key playing in a slot b^2 in its mounting b^3 , and two disks b^4 at right angles to each other and bearing suitable indicating marks, as for example, the numerals "two" and "four" respec-

tively, facilitate rotation of the key, and at the same time indicate which stylus is thus operatively disposed.

It will be obvious, that it is a matter of indifference whether the forward or rear end of the pin a^3 , constituting the stylus holder, be adapted for operation by a key or like device, and in the form of lever illustrated in Fig. 4, I thus show the rear end a^{11} of the pin prolonged and squared, adapting it for operation by a key mounted on the opposite side of the reproducer holder from that illustrated in Figs. 1 and 2.

While it has always been found that a little play is necessary in the pivotal mounting of the stylus lever A' on the floating weight of the reproducer for the reason that the thread of the record is apt to be a trifle distorted in curing the latter, especially where the material used in its construction is celluloid or of like composition, obviously this distortion will have a relatively greater effect in the case of records such as the "four minute" records referred to herein, where the threads are finer and more closely crowded together. It accordingly becomes desirable to provide for the lateral oscillation of the stylus lever as well as for its movement about its transverse axis, and not merely to trust to the looseness of the fitting of the stud C that secures the lever to the plate, or to the looseness of the pivotal pin a^4 itself in such stud. To this end I provide such stud with a transverse slot c , or rather aperture, of circular cross-section, that is intersected by the vertical slot c' in which the lever plays. The ends of the pivot pin of the lever rest in the portion of such aperture on either side of the intersecting slot so that while such pin is thus held against dislodgment, it is nevertheless free to assume various angular positions about the axis of the stud. At the same time the freedom of its normal movement in the plane of such axis is not interfered with in the least. This particular pivot pin construction, it should be explained, forms no part of the present invention, being described and claimed in my co-pending application, Serial No. 472,688, filed January 16, 1909.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In a phonograph reproducer, the combination of the diaphragm; a floating weight; stylus-holding means including a member mounted on said weight so as to be pivotal about two angularly related axes

passing through said member, said member being provided with a plurality of styluses; and means connecting said member with the diaphragm.

2. In a phonograph reproducer, the combination of the diaphragm; a floating weight; stylus-holding means including a member mounted on said weight so as to be pivotal about two angularly related axes passing through said member, said member being provided with a plurality of styluses; and a link connecting said member with the diaphragm while still permitting rotation of said member about both its axes.

3. In a phonograph reproducer, the combination of the diaphragm; a floating weight; stylus-holding means including an elongated member mounted on said weight so as to be pivotal about a longitudinal axis and also about a transverse axis intermediate between its ends, said member being provided at one end with a plurality of styluses respectively adapted to contact with a record in different positions of said member about its longitudinal axis; and means connecting the other end of said member with the diaphragm.

4. In a phonograph reproducer, the combination of the diaphragm; a floating weight; stylus-holding means including an elongated member mounted on said weight so as to be pivotal about a longitudinal axis and also about a transverse axis intermediate between its ends, said member being provided at one end with a plurality of styluses respectively adapted to contact with a record in different positions of said member about its longitudinal axis; a sleeve upon the other end of said member; and a link attached at its upper end to the diaphragm and pivotally connected at its lower end to said sleeve.

5. In a phonograph reproducer, the combination of the diaphragm; a floating weight; stylus-holding means including a member mounted on said weight so as to be pivotal about two angularly related axes passing through said member, said member being provided with a plurality of styluses; a link connecting said member with the diaphragm while still permitting rotation of said member about both of its axes; and means projecting beyond said reproducer and adapted to rotate said member.

6. In a phonograph reproducer, the combination of the diaphragm; a floating weight; stylus-holding means including an elongated member mounted on said weight so as to be pivotal about a longitudinal axis and also about a transverse axis intermediate between its ends, said member being provided at one end with a plurality of styluses respectively adapted to contact with a record in different positions of said member about its longitudinal axis; means connecting the

other end of said member with the diaphragm; and a key adapted to rotate said member, said key projecting beyond said reproducer, and bearing means at its outer end indicating the stylus in operative position.

7. In a phonograph reproducer, the combination of the diaphragm; a floating weight; stylus-holding means including an elongated member mounted on said weight so as to be pivotal about a longitudinal axis and also about a transverse axis intermediate between its ends, said member being provided at one end with a plurality of styluses respectively adapted to contact with a record in different positions of said member about its longitudinal axis; a sleeve upon the other end of said member; a link attached at its upper end to the diaphragm and pivotally connected at its lower end to said sleeve; a key adapted to rotate said first member; said key projecting beyond said reproducer; and means limiting the rotation of said key in either direction to correspond with the operative position of said styluses respectively.

8. In a phonograph reproducer, the combination of the diaphragm; a floating weight; stylus holding means mounted on said weight and including two members, one rotatable within the other; a plurality of styluses on such rotatable member respectively adapted to contact with a record in different positions of said member; a link connecting such other member with said diaphragm; a key adapted to rotate said first member, said key projecting beyond said reproducer; means limiting the rotation of said key in either direction to correspond with the operative position of said styluses, respectively; and means on the outer end of said key indicating the stylus thus positioned.

9. In a phonograph reproducer, the combination of the diaphragm; a floating weight; stylus-holding means mounted on said weight and including two members, one rotatable within the other; a plurality of radially projecting, angularly related styluses on such rotatable member respectively adapted to contact with a record in different positions of said member; a link connecting said member with the diaphragm; a key adapted to rotate said first member, said key projecting beyond said reproducer; means limiting the rotation of said key in either position of said styluses, respectively; and angularly related faces on the outer end of said key bearing marks to indicate the stylus thus positioned.

10. In a phonograph reproducer, the combination of the diaphragm; a floating weight; stylus holding means mounted on said weight and including two members, one rotatable within the other; a plurality of styluses on such rotatable member re-

spectively adapted to contact with a record in different positions of said member; a link connecting such other member with said diaphragm; a key adapted to rotate said first member, said key projecting beyond said reproducer; means limiting the rotation of said key in either direction to correspond with the operative position of said styluses, respectively; and angularly related disks on the outer end of said key bearing characters indicating the stylus thus positioned.

11. In a phonograph reproducer, the combination of the diaphragm, a floating weight, a tubular lever pivoted to said weight and connected with said diaphragm, and a stylus holder rotatably held in the tube of said lever and provided with a plurality of styluses respectively adapted to contact with a record in different positions of said holder.

12. In a phonograph reproducer, the combination of the diaphragm, a floating weight, a tubular lever pivoted to said weight, and connected with said diaphragm, and a stylus holder in the form of a pin rotatably held in said lever and provided with a plurality of styluses respectively adapted to contact with a record in different axial positions of said holder within said lever, said pin being formed for engagement with a member apart from the pin whereby the pin may be rotated.

13. In a phonograph reproducer, the combination of the diaphragm, a floating weight, a tubular lever pivoted to said weight and connected with said diaphragm, and a stylus holder in the form of a pin rotatably held in said lever and provided with a plurality of styluses respectively adapted to contact with a record in different axial positions of said holder within said lever, one end of said pin being made angular to receive a key whereby it may be rotated.

14. In a phonograph reproducer, the combination of the diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, said lever being of adjustable diameter, and a pin rotatably held in said lever and provided with a plurality of styluses respectively adapted to contact with a record in different axial positions of said pin within said lever.

15. In a phonograph reproducer, the combination of the diaphragm, a floating weight, a lever in the form of a split sleeve pivoted to said weight and connected with said diaphragm, and a pin rotatably held in said sleeve and provided with a plurality of styluses respectively adapted to contact with a record in different axial positions of said pin within said sleeve.

16. In a phonograph reproducer, the combination of the diaphragm, a floating weight, a lever in the form of a split sleeve pivoted to said weight and connected with said diaphragm, a pin rotatably held in said sleeve

and provided with a plurality of styluses respectively adapted to contact with a record in different axial positions of said pin within said sleeve, and an adjusting screw for
5 said sleeve to secure said pin more or less tightly therein.

17. The combination of a reproducer, said reproducer including a movable member and a plurality of styluses borne thereby and
10 adapted to be operatively disposed with respect to a record in different positions of said member, respectively; and means apart from said member adapted to engage said member thus variously to position the same.

18. The combination of a reproducer, said reproducer including the diaphragm, a float-
15 ing weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder rotatably mounted on said lever
20 and provided with a plurality of styluses respectively adapted to contact with a record in different positions of said holder; and

means apart from said holder adapted to engage said holder thus variously to position
25 the same.

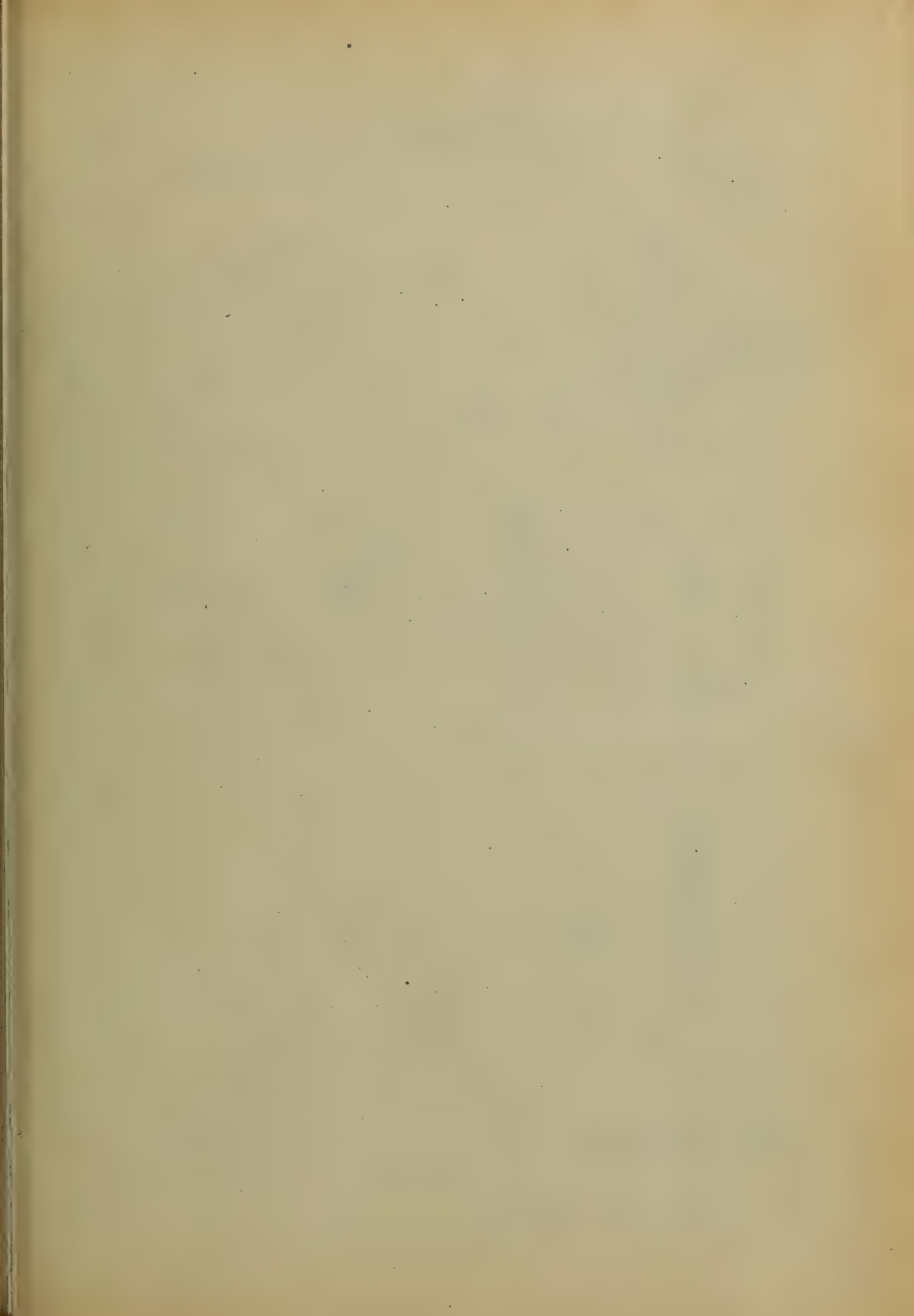
19. The combination of a reproducer, said reproducer including the diaphragm, a float-
ing weight, a tubular lever pivoted to said weight and connected with said diaphragm,
30 a stylus holder in the form of a pin rotatably held in said lever and provided with a plurality of styluses respectively adapted to contact with a record in different axial positions of said holder within said lever, one
35 end of said pin being made angular, and a key adapted to detachably engage such angular end of the pin thus variously to position the latter.

Signed by me this 26th day of January, 1909.

HARRY B. McNULTY.

Attested by—

CHRISTINE E. ARUS,
JNO. F. OBERLIN.



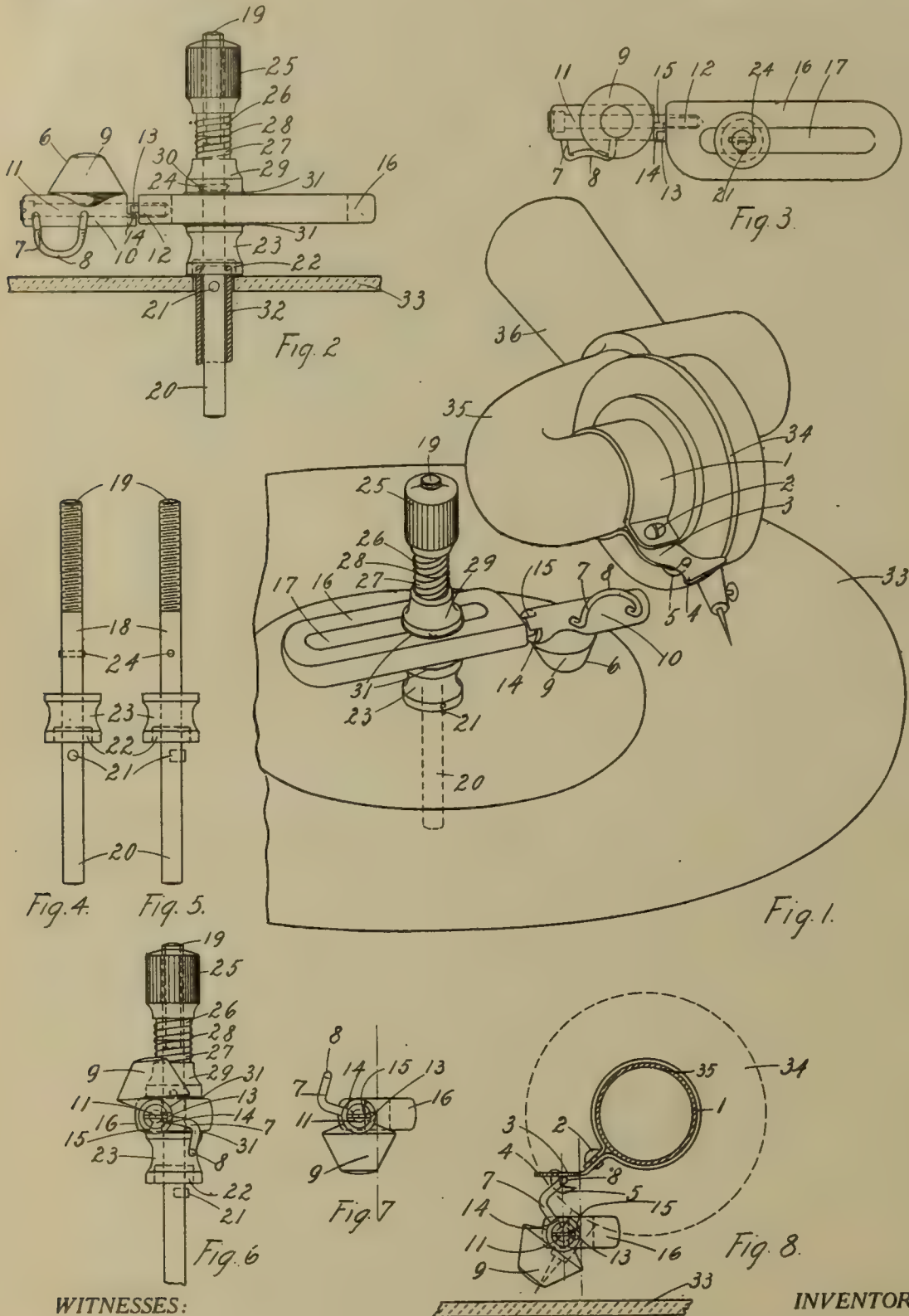
W. G. ALTENBURGH.

AUTOMATIC CUT-OFF AND STOP FOR SOUND REPRODUCING MACHINES.

APPLICATION FILED JULY 26, 1909.

972,794.

Patented Oct. 18, 1910.



WITNESSES:

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INVENTOR.

Wilford G. Altenburgh

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A. B. Downman

ATTORNEY.

UNITED STATES PATENT OFFICE.

WILFORD G. ALTENBURGH, OF NATIONAL CITY, CALIFORNIA.

AUTOMATIC CUT-OFF AND STOP FOR SOUND-REPRODUCING MACHINES.

972,794.

Specification of Letters Patent.

Patented Oct. 18, 1910.

Application filed July 26, 1909. Serial No. 509,620.

To all whom it may concern:

Be it known that I, WILFORD G. ALTENBURGH, a citizen of the United States, residing at National City, in the county of San Diego and State of California, have invented a certain new and useful Improvement in Automatic Cut-Offs and Stops for Sound-Reproducing Machines, of which the following is a specification.

My invention relates to an improved automatic cutoff and stop for sound reproducing machines, and is more particularly adapted to machines using the disk record.

The objects are:—to provide a simple, cheap, safe and positive means for automatically raising the needle and stopping the machine at the end of the record, or at any predetermined point when desired; further, it is adjustable to different records and is adaptable to different makes of machines now in use and may be used therewith.

The uses and advantages of my invention will readily be apparent from the following description, references being had to the accompanying drawings, in which—

Figure 1 is a partial perspective view of the sound reproducing mechanism and showing my automatic cutoff and stop complete as used therewith. Fig. 2 is an elevational view of part of my device assembled. Fig. 3 is a top view thereof. Figs. 4 and 5 are side views of spindle 20, the one transverse to the other. Fig. 6 is a transverse elevational view of Fig. 2. Fig. 7 is a detail of the arm with the stop attachment thereon and Fig. 8 a side view of the portion on the sound tube, in connection with the arm and its attachment, showing the sound box and needle in dotted lines after the machine is stopped.

Similar characters of reference refer to similar parts throughout the several views.

My device is composed of two assembled parts, one of which is attached to the central vertical post of the machine while the other is attached to the sound tube of said machine. 34 represents the sound box with the needle, 33 a disk record, 35 a sound tube and 36 a portion of a horn all of which are of the ordinary style. Around the sound tube 35 and adjacent to the sound box 34 is placed a clamp 1, adapted to be clamped tight thereon by means of screw 2, one portion of said clamp being extended and formed so as to be approximately upon a

horizontal plane with this disk, and into which is riveted hook 5.

Into the vertical post 32 of the machine I have provided a central hole and in its top have provided a slot on one side so as to fit the spindle 20 and pin 21 therein. This keeps the spindle 20 from turning after the insertion into said vertical post. Upon spindle 20 is rigidly set an arm clamp 23 shaped as shown best in Figs. 4 and 5, being provided with a recess 22 in its bottom surface to fit over the top of the central post 32 and rests upon the record 33. Above said arm clamp 23 is placed another arm clamp 29 upon said spindle 20 with an extended portion 27 extended upward and in the lower side is provided with a slot 30 adapted to fit over pin 24 which extends through spindle 20 and into the slot in the upper arm clamp 29. The top end of said spindle is provided with a thread 19 on which thumb nut 25 is adapted to screw, the extended portion 26 being downward and adjacent to portion 27. Over portions 26 and 27 a compression spring 28 is placed for the purpose of keeping a slight compression on the upper arm clamp 29 when the thumb nut 25 is released for adjusting the arm 18. Between the two arm clamps 29 and 23, and on said spindle, is placed adjusting arm 16 and washers 31, one on each side, for the purpose of allowing the spindle to revolve a little independent of the arm 16, when the nut 25 is tightened, thus producing a gradual stop. Said adjusting arm 16 is provided with a slot 17 a trifle wider than the spindle 20 and adapted to allow adjustment of the arm 16 endwise. Into the extended end of said arm 16 is screwed a stud 11, a little to one side of the center as shown and upon which is mounted a cylinder 10, in one side of said cylinder 10 is inserted a U shaped catch adapted to operate in connection with hook 5 and on the lower side a weight 6. On the inner end of said cylinder 10 is provided a lug 15 adapted to come in contact with another lug 13 upon the arm 16, when the cylinder revolves to a certain position in relation to the arm 16.

It can readily be seen that by this method of construction, after adjusting the clamp 1 upon the sound tube 35, then setting the needle in the end of the record groove with disk 33 and with nut 25 released and cylinder 10 turned so that weight 9 is on top as shown in Fig. 2, and setting the point 6

of the weight with point 3 of the clamp then tighten the thumb nut 25 and start the machine as usual, that when the point 3 touches point 6 sufficiently, the weight 9 is thrown
 5 over center which brings U catch 8 up into position as shown in Fig. 1, and the machine coming around again the hook 5 will catch into U catch 8 which will revolve cylinder
 10 until lug 15 comes in contact with lug 13 on arm 16 which prevents further revolution of cylinder 10 which gradually raises the needle and stops the machine.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:--
 15

1. In a sound reproducing machine, a sound tube, a sound box, a needle, a projecting arm adjustably mounted upon the central post of the machine and provided with a revoluble catch mounted upon the extended end
 20 of said arm and a hook mounted on said sound tube, adapted to engage with said revoluble catch for raising said needle and stopping said machine, all substantially as set forth.
 25

2. In a sound reproducing machine, the combination of a sound tube, a sound box, a needle, an arm provided with a slot and mounted upon a spindle set in the central
 30 post of the machine and provided with a pin to prevent its turning, clamps on said spindle on each side of said arm, a thumb nut screwed on the top end of said spindle for tightening said clamp, a spring to provide a slight tension on the clamp at all
 35 times, a catch mounted on a cylinder set in the extended end of said arm, a weight mounted upon said cylinder, a lug on said

cylinder for stopping it at a certain position, and a clamp attached to said sound tube and provided with a hook adapted to engage with the the said catch, all substantially as set forth. 40

3. In a sound reproducing machine, the combination of a sound tube, a sound box, a
 45 needle, a radially projecting arm mounted upon the central post of the machine and adapted to be adjusted longitudinally, and having a catch revolvably mounted upon said arm, and an adjustable clamp mounted upon
 50 said sound tube and provided with a hook adapted to engage with said catch for raising said needle and stopping said machine, all substantially as set forth.

4. In a sound reproducing machine, the
 55 combination of a sound tube, a sound box, a needle, a radially projecting arm provided with a slot and mounted upon a spindle, said spindle being set vertically into a hole in the central post of the machine and provided
 60 with a pin to prevent its turning, clamps on said spindle on each side of said arm, means for tightening said clamp, a catch revolvably mounted on a stud screwed horizontally into the extended end of said arm and provided
 65 with a weight for setting the position of said clamp, means for stopping the revolution of said catch, and a clamp attached to said sound tube and provided with a hook adapted to engage with said catch to raise
 70 said needle and then stop the machine, all substantially as set forth.

WILFORD G. ALTENBURGH.

Witnesses:

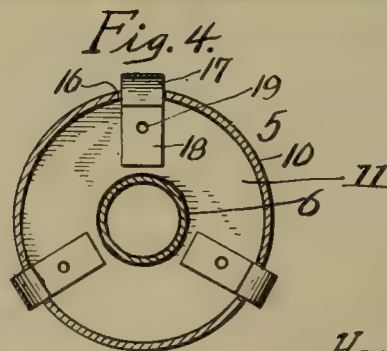
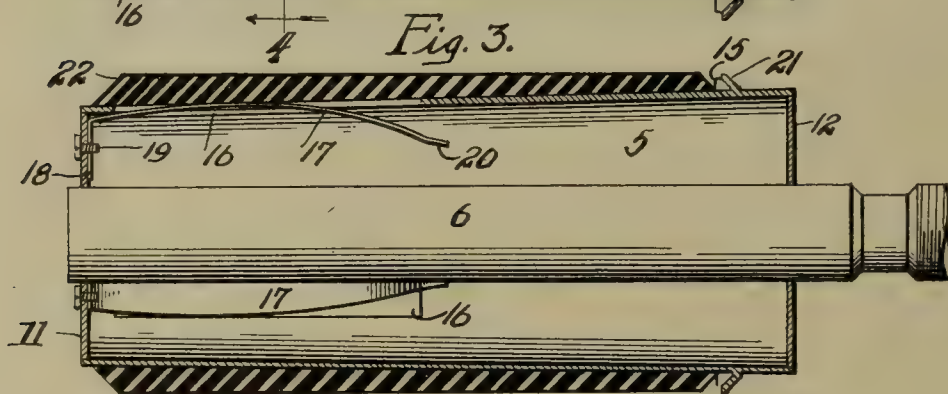
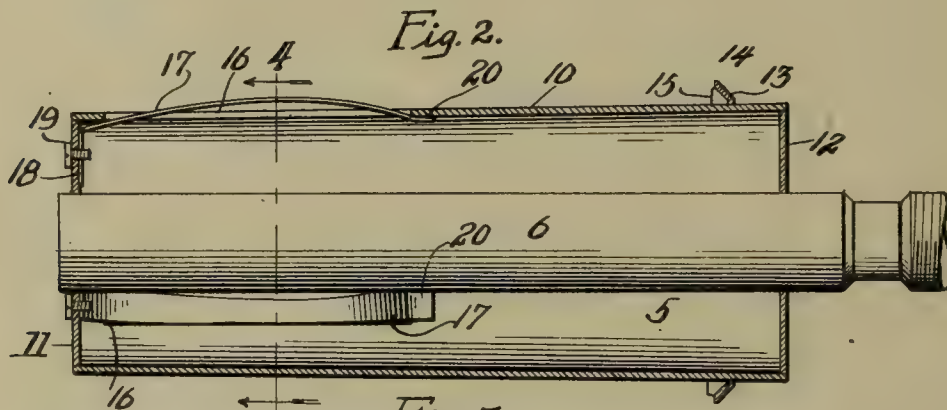
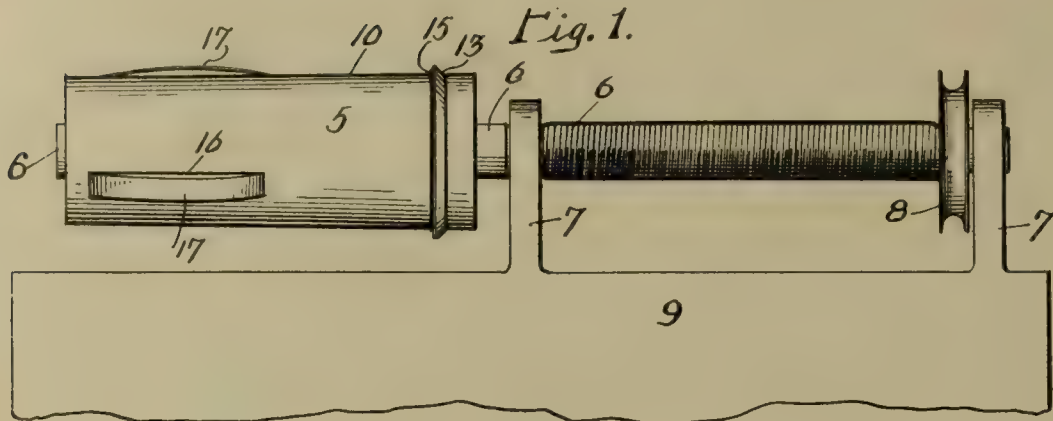
CLAUD T. DAVENPORT,
 ABRAM B. BOWMAN.



H. N. KISTNER.
 MANDREL FOR PHONOGRAPHS.
 APPLICATION FILED FEB. 25, 1910.

973,203.

Patented Oct. 18, 1910.



Witnesses:

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 Attorneys.

UNITED STATES PATENT OFFICE.

HENRY N. KISTNER, OF ZION CITY, ILLINOIS, ASSIGNOR TO ROBERT F. MUELLER, OF CHICAGO, ILLINOIS.

MANDREL FOR PHONOGRAPHS.

973,203.

Specification of Letters Patent.

Patented Oct. 18, 1910.

Application filed February 25, 1910. Serial No. 546,024.

To all whom it may concern:

Be it known that I, HENRY N. KISTNER, a citizen of the United States, residing at Zion City, in the county of Lake and State of Illinois, have invented certain new and useful Improvements in Mandrels for Phonographs, of which the following is a specification.

The present invention relates to a mandrel used in connection with a phonograph, for the purpose of holding a phonographic record. In use, the mandrel is actuated to rotate the record for the purpose of bringing every portion of the record into engagement with the needle of the phonograph.

One object of the present invention is to design a mandrel which will accommodate the record and permit it to be readily slipped thereon and retained in position under various conditions of heat and cold, which varying conditions act upon the substance composing the record to change its size.

Another object of the invention is to form an abutment upon the mandrel to prevent the record from being slipped too great a distance thereon.

A further object of the invention is to form a cushion upon the mandrel, against which the end of the record strikes when it has been forced to the desired distance upon the mandrel.

The invention further consists in the features of construction and combination of parts hereinafter described and claimed.

In the drawings, Figure 1 is an elevation, showing the mandrel in operative position, and showing a portion of the mechanism for operating the needle and mandrel; Fig. 2, a sectional elevation of the mandrel; Fig. 3, a view similar to Fig. 2, showing a record in place upon the mandrel, and showing the abutment formed integral with the body of the mandrel; and Fig. 4, a section on line 4-4 of Fig. 2, looking in the direction of the arrow.

Owing to the peculiar composition of phonographic records, it has been found that the diameter of the same will change under heat and cold, expanding somewhat under heat and contracting somewhat under cold. The mandrel upon which the record is mounted must necessarily be so constructed that when the record is slipped thereon a tight engagement will be maintained between the inner surface of the rec-

ord and the outer surface of the mandrel. This is necessary because if the record should slip upon the surface of the mandrel the surface of the record would not pass continuously by the needle, thus, of course, breaking the continuity of the sound coming from the horn of the phonograph. It has been the practice to form the mandrels with a tapered body, and to form the interior surface of the record with a similar taper. Thus, by forcing the record onto the mandrel, the tapered surfaces would co-act with one another to lock the record securely upon the mandrel; but difficulty has been found, because of the variation in size of the record, in placing the record upon the mandrel so that it would not become wedged so tightly upon the surface of the mandrel that the composition of the record would crack or splinter, and thus damage the record so that it could not be used any further for the purpose of reproduction. The mandrel must, of course, be of a size to accommodate the record under its most expanded condition, otherwise the record in the expanded condition would slip upon the surface of the mandrel; and when the contraction takes place the record will have to be forced more or less in order to slip it a sufficient distance upon the mandrel to bring the surface into proper engagement with the needle; and in forcing the record in this manner the sloping surface of the mandrel will act as a wedge and will crack or splinter the end of the record, and, as heretofore stated, mutilate the record so that it will be of no further use. Applicant overcomes this difficulty by forming a resilient contacting surface upon the mandrel, which impinges against the record and holds it sufficiently firm so that no turning of the record, independent of the mandrel, is possible, and yet permits the record which has been shrunk out of normal condition to be placed upon the mandrel without the necessity of forcing the same thereon and splitting the ends thereof; and the abutment prevents the user from forcing the record to a point upon the mandrel where the slope of the outer surface of the mandrel will be greater than the slope of the inner surface of the record and cause the end of the record to become shattered or split.

The mandrel 5 is mounted upon a shaft

6, which extends therethrough and is journaled within suitable brackets 7. The shaft, as shown in Fig. 1, is screw-threaded for a portion of its way, and upon these screw threads is fed the needle-carrying mechanism, in a manner commonly known to all versed in the phonographic art. This needle-carrying mechanism forms no part of the present invention, and is so well known, as to its construction and operation, that a detailed description and illustration thereof are not deemed necessary.

Attached to the shaft 6 is a driven pulley 8, which is suitably connected to any desired form of driving mechanism, and the mandrel, shaft, and auxiliary parts are mounted upon a suitable base or support 9, of the ordinary size and configuration employed in phonographs.

The mandrel 5 of the present invention, as shown, consists of a tapered cylindrical surface 10, supported and held in position by a front wall 11 and a rear wall 12, both of which walls are attached to and rotate with the shaft 6, and both of which walls are attached to the tapered surface 10, so that movement is imparted to the entire mandrel by the rotation of the shaft 6. The mandrel is formed, adjacent to its inner end, with a conical collar 13, which serves as an abutment to prevent the record from being forced too far upon the mandrel; and the conical shape of the collar, as shown, leaves a recess 14 between its inner face and the outer face of the tapered surface 10, into which recess is set a ring 15 of suitable cushioning substance. The tapered surface 10 is provided with a plurality of elongated recesses 16, through each of which projects a flat spring 17, which springs, as shown, are formed to exert an outward spring tension. The springs 17 are secured at one end 18 thereof by means of screws 19, or other suitable fastening devices, which are entered through the front wall 11 of the mandrel body, and the free end 20 of the spring 17 rests against the inner face of the tapered surface 10 adjacent to the inner edge of the recess 16.

In Fig. 3 is shown a modified form of construction, in which a conical collar 21 is formed integral with the tapered surface 10; and in this same figure is shown a phonographic record 22 mounted in operative position upon the mandrel. As will be seen by referring to this figure, the springs 17 will impinge against the inner surface of the record, thus holding it in tight engagement, so that it will be rotated in unison with the rotation of the mandrel; and it will be further seen, by referring to this figure, that the edge of the record abuts against the cushioning substance, so that no danger of cracking or splintering thereof is incurred when it is being positioned. The

record, as shown, fits substantially tight upon the body of the mandrel, but it is obvious that if the record should become expanded through heat action it will still be held in firm engagement with the mandrel by the springs 17, which would then extend farther above the periphery of the tapered surface 10 and impinge against the inner surface of the record, thus holding it in just as tight engagement as it would be under normal conditions, so that, by making the mandrel of a size to accommodate the record under its most contracted condition, no forcing of the record upon the mandrel will be necessary under any conditions, in order to hold it in sufficiently firm engagement to prevent the slipping of the record upon the surface of the mandrel.

I claim:

1. In a device of the class described, the combination of a mandrel body and a resilient member attached to said body, said resilient member impinging against a record mounted upon the mandrel and preventing rotation of the record upon the surface of the mandrel, a hollow outwardly flaring collar upon the mandrel forming an abutment to prevent the record from being forced upon the mandrel beyond a predetermined distance, and an outwardly flaring strip of cushioning substance lying within said collar and presenting a substantially broad, flat, outer surface, said collar forming a retainer for said cushioning substance holding it in position upon the mandrel body, the end of the record striking against the outer surface of said cushioning substance when the record is slipped onto the mandrel, substantially as described.

2. In a device of the class described, the combination of a tapered mandrel body having an elongated slot therein, a flat spring having one end attached to the interior of said mandrel, said spring curving upwardly through said slot and having its free end resting against the wall of the mandrel body upon the interior thereof, said spring presenting an elongated curved surface for impinging against the inner surface of a record mounted upon the mandrel to prevent rotation of the record upon the mandrel, the curved contacting surface of the spring being forced into the interior of the mandrel body by the insertion of a record upon the mandrel, whereby a small engaging surface is presented by the spring when a record of substantially tight fit is placed on the mandrel, and a large engaging surface is presented by the spring when a loose fitting record is inserted on the mandrel, substantially as described.

3. In a device of the class described, the combination of a tapered mandrel body having an elongated slot therein, a flat spring having one end attached to the interior of

said mandrel, said spring curving upwardly through said slot and having its free end resting against the wall of the mandrel body upon the interior thereof, said spring presenting an elongated curved surface for impinging against the inner surface of a record mounted upon the mandrel to prevent rotation of the record upon the mandrel, the curved contacting surface of the spring being forced into the interior of the mandrel body by the insertion of a record upon the mandrel, whereby a small engaging surface is presented by the spring when a record of substantially tight fit is placed on the mandrel, and a large engaging surface is presented by the spring when a loose fitting record is inserted on the mandrel, a hollow outwardly flaring collar upon the mandrel forming an abutment to prevent the record from being forced upon the mandrel beyond a predetermined distance, and an outwardly flaring strip of cushioning substance lying within said collar and presenting a substantially broad, flat, outer surface, said collar forming a retainer for said cushioning substance and holding it in position upon the mandrel body, the end of the record striking against the outer surface of the cushioning substance when the record is inserted upon the mandrel, substantially as described.

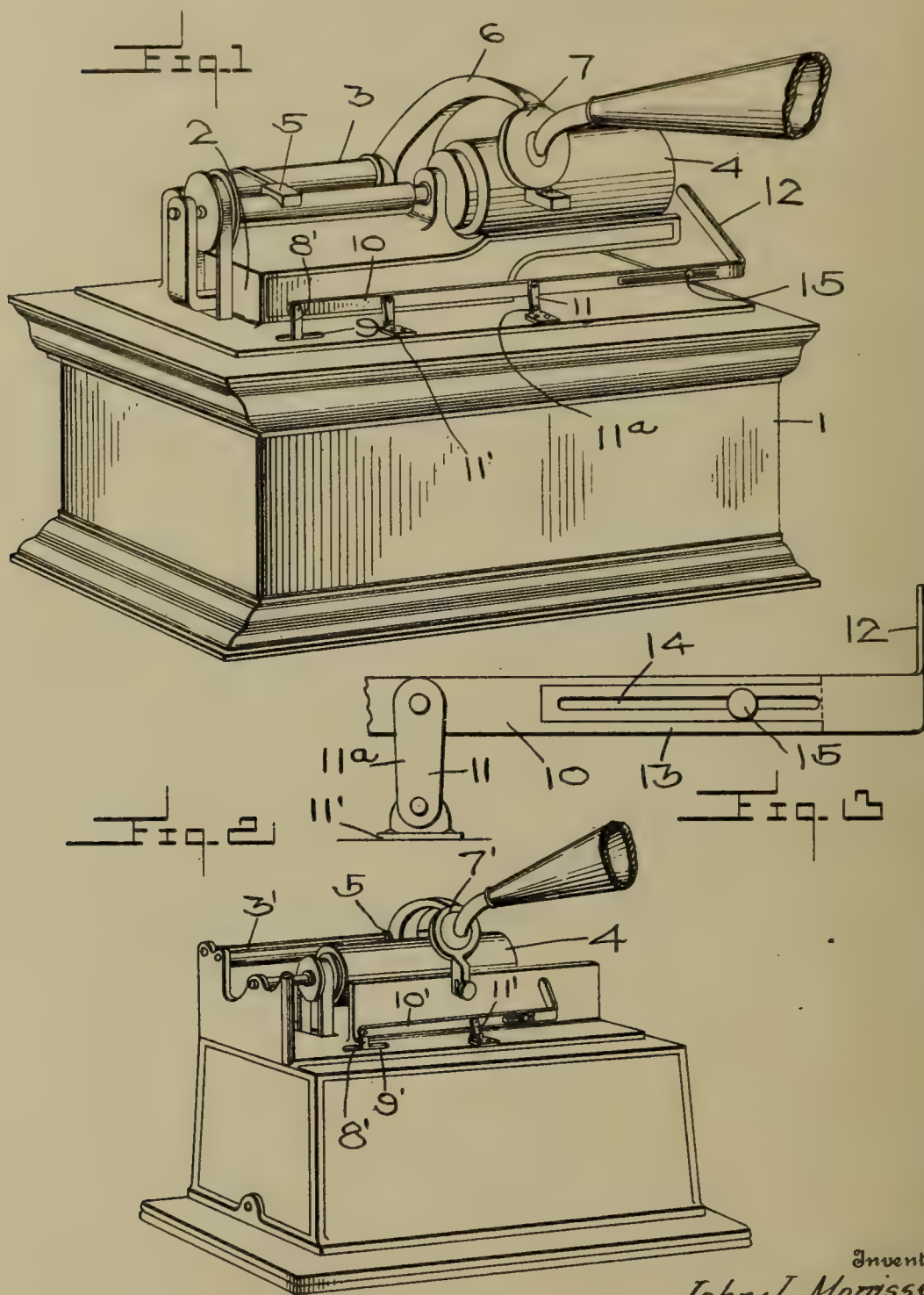
HENRY N. KISTNER.

Witnesses:
MARY R. FROST,
WM. P. BOND.

J. J. MORRISSEY.
 AUTOMATIC CHECK FOR PHONOGRAPHS.
 APPLICATION FILED JULY 26, 1909.

973,205.

Patented Oct. 18, 1910.



Witnesses
 Morris design
 Ed. C. Lusby

Inventor
 John J. Morrissey
 By *Woodward + Chandler*
 Attorneys

UNITED STATES PATENT OFFICE.

JOHN J. MORRISSEY, OF WHITE BEAR LAKE, MINNESOTA.

AUTOMATIC CHECK FOR PHONOGRAPHS.

973,205.

Specification of Letters Patent.

Patented Oct. 18, 1910.

Application filed July 26, 1909. Serial No. 509,475.

To all whom it may concern:

Be it known that I, JOHN J. MORRISSEY, a citizen of the United States, residing at White Bear Lake, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Automatic Checks for Phonographs, of which the following is a specification.

This invention relates to improvements in automatic mechanism for stopping the motor of a phonograph when the reproducer has reached the end of the record cylinder.

An object of my invention is to provide an extremely simple and inexpensive device of this character which may be readily attached to phonographs at present constructed and which may be adjusted to conform to the various lengths of the records which are upon the cylinder.

Another object is to provide a device which will be automatically set in the proper position for stopping the motor of the machine, when the starting lever has been moved to its proper operative position.

A further and more particular object is to provide a controlling lever and support therefor of novel and simple construction.

In the drawings: Figure 1 is a perspective view of the large size type of phonograph, showing the stop mechanism applied thereto, Fig. 2 is a similar view of a smaller size type of machine, with a slight modification of my device, Fig. 3 is a detail view of the controlling lever, comprising my invention.

Referring to Fig. 1 of the drawings, 1 indicates the casing for the motor mechanism, and 2 the frame which supports the phonograph mechanism. This mechanism comprises the main longitudinal shaft 3, the cylinder 4, the feed block 5, the reproducer arm 6, and the reproducer 7. These various elements comprise the principal features of the ordinary phonograph as at present constructed and are suitably connected and operated by the motor mechanism contained within the casing. In this type of machine the stopping lever 8' protrudes from the casing through a slot 9 formed in the base plate of the supporting frame 2, and extends for some distance above the top thereof. To the upper end of this lever one end of the longitudinally extending controlling lever 10 is secured, this lever being supported upon the base plate of the frame 2 by means of links 11 which are pivotally supported upon said

plate and connected to the controlling lever, so that longitudinal movement of the controlling lever will oscillate the starting lever, and the controlling lever will rock upon the links. The other end of the controlling lever 10 is extended rearwardly and upwardly as shown at 12 and its position with relation to the reproducer of the phonograph mechanism, is such that the same will contact with the portion 12 of the controlling lever to stop the operating mechanism, as will be later described. The links 11 are carried by suitable bracket plates 11' having two perforations therein receiving suitable fastening members engaged with a part of the phonograph frame, the plates being provided at one side with an upwardly extended perforated ear 11^a in which there is engaged a suitable pintle, upon which the link is pivotally carried. The brackets 11', the links and the two members of the controlling lever 10 are all formed of sheet metal, which reduces the cost of the device to a minimum and simplifies its construction to a marked degree.

To provide for the stopping of the mechanism at various periods of the longitudinal movement of the reproducer, the arm 12 of the controlling lever is provided with a horizontal extension, which is adjustably secured to the controlling lever 10 and is adjustable with relation to the end of the cylinder. A recess 13 is formed in one side of the controlling lever 10, said recess opening at the end of the lever opposite to the point of connection with the starting lever 8' and this extension 12 has its lower horizontal portion suitably reduced in width and thickness and is disposed slidably within the recess 13, the shoulder formed by the reducing of this horizontal portion being adapted to abut the end of the controlling lever, when at the limit of its inward movement. A longitudinal slot 14 extends the greater portion of the length of the horizontal portion of the member 12, the shank of the set screw 15 being extended through the same, and screw threadedly engaged in the extremity of the controlling lever, by which means it will be seen, that the member 12 may be extended outwardly longitudinally of the phonograph cylinder, so that the rearwardly and upwardly extended portion thereof may be disposed to engage the reproducer at the point at which the record of the cylinder terminates. The set screw 15

will secure the member 12 in its adjusted position, and retain the same in such position against any liability of accidental movement so that the lower end of the reproducer 5 will not contact with the extension 12 of the controlling lever until it has reached the end of the cylinder. When this occurs the reproducer will move the controlling lever 10 longitudinally and throw the starting lever 9 to the right, so that the motor mechanism will be instantly stopped. The links 11, which are pivotally connected with the base of the frame 2 will thus be disposed at an inclination to the controlling lever and 15 when the starting lever is again actuated to start the operating mechanism, the controlling lever will be drawn to the left, whereupon the links 11 will again assume their vertical positions and the rearwardly and 20 upwardly extending end portion of the controlling lever will be returned to its normal operative position.

In Fig. 2 I have shown my improved stopping mechanism applied to the smaller 25 type of phonograph now in common use. In this construction of the machine, the main shaft 3', above which the feed block 5 is disposed, is located behind and in parallel relation to the cylinder 4. The reproducer 30 arm is directly connected with the shaft 3', and extends over the front of the cylinder and has secured therein the reproducer 7', thus greatly contracting the length of the machine. The stopping device does not essentially differ from the construction which 35 is employed in the machine shown in Fig. 1. In this form, however, but one link 11' is necessary to support the longitudinal controlling lever 10'. This link is pivoted to the 40 lever and to the base of the supporting frame, and operates in a similar manner to the links 11 as previously described. One end of the controlling lever 10' is secured to the upper end of the starting lever 8', and is adapted 45 to actuate the same to start and stop the operating mechanism when moved to either end of the slot 9'. The other end of the controlling lever is extended rearwardly and upwardly and is adapted to be engaged by 50 the lower end of the reproducer to move the starting lever to the right, when the reproducer has reached the end of the record upon the cylinder. The controlling lever 10' will also be returned automatically to its normal 55 operative position by the movement of the starting lever to the left when it is desired to start the operating mechanism.

From the foregoing it will be seen that I have provided an extremely simple and inexpensively constructed device which may 60 be readily secured upon phonographs of the various types as at present constructed, and requires no especial provision by means of which the same is to be attached to the supporting frame. 65

My improved stop mechanism is particularly adapted for use upon commercial phonographs, where it is essential that the operator should be relieved from the many 70 attentions which it is necessary that he should give to the machine during the transcription of the record. By the use of my improved stop mechanism the operator may give his entire attention to the elucidation 75 of the matter recorded upon the cylinder, whereby much better results may be secured than have heretofore been possible.

What is claimed is:

An automatic stop for phonographs or the like, comprising a combination with a 80 frame, a longitudinally movable reproducer and an oscillating starting lever projecting upwardly through the frame, of a controlling lever secured at one end to the upper end of the starting lever, said controlling 85 lever having a longitudinal recess formed in one side thereof and opening on the opposite end to that secured to the starting lever, a bracket plate secured on the frame below said controlling lever, said plate having an 90 upwardly extending perforated ear, a pintle therethrough, a link pivotally mounted upon said pintle and pivotally connected to said controlling lever intermediate of its length, a rearwardly and upwardly extended arm 95 having a horizontal extension, said horizontal extension being reduced in width and thickness for a greater portion of its length, said reduced portion being provided with a longitudinal slot throughout its length, said 100 reduced portion being slidably mounted in the recess, a set screw extending through said slot and engaged in the extremity of said controlling lever, said arm being 105 adjustably disposed in the path of the reproducer and adapted to actuate said starting lever upon engagement therewith.

In testimony whereof I affix my signature, in presence of two witnesses.

JOHN J. MORRISSEY.

Witnesses:

H. O. WARNER,
A. J. AUGER.



W. W. YOUNG.
TALKING MACHINE DIAPHRAGM.
APPLICATION FILED JAN. 5, 1910.

973,735.

Patented Oct. 25, 1910.

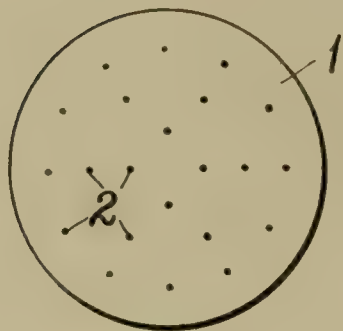


FIG. 1.

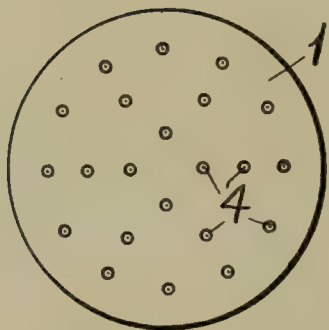


FIG. 2.



FIG. 3.

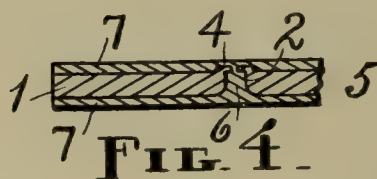


FIG. 4.

Witnesses
A. C. Fairbanks.
M. S. Fairbanks

Inventor
William W. Young,
by Webster & Co.,
Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM W. YOUNG, OF SPRINGFIELD, MASSACHUSETTS.

TALKING-MACHINE DIAPHRAGM.

973,735.

Specification of Letters Patent.

Patented Oct. 25, 1910.

Original application filed December 12, 1908, Serial No. 467,225. Divided and this application filed January 5, 1910. Serial No. 536,473.

To all whom it may concern:

Be it known that I, WILLIAM W. YOUNG, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented a new and useful Talking-Machine Diaphragm, of which the following is a specification, the same being a divisional part of my application filed in the United States Patent Office December 12, 1908, and serially numbered 467,225.

My invention relates to improvements in reproducing diaphragms for talking-machines, and consists of thin, imporous, sheet material having perforations therein, which material may have burs or bosses thereon and a filling and coating in the perforations and on one or both sides, said filling and coating having been hardened by compression and heat. Or, differently stated, it may be said that the new diaphragm consists of thin, perforated material either with or without burs thereon and if with burs then either with or without them in a flattened condition, and either with or without the filling and coating hardened by compression and heat, the diaphragm in the first case being of one material or homogeneous and in the second case of different materials or heterogeneous.

With the mica and the ordinary sheet-metal, reproducing diaphragms commonly used in talking machines, it has not been possible to obtain the best results from such machines, because neither of these diaphragms is capable of producing such results; moreover, the mica diaphragms or disks, which greatly exceed in number the ordinary sheet-metal diaphragms or disks, are very fragile and also expensive since there is a great waste incident to procuring disks of the proper size and character; the mica disks, too, deteriorate with use.

The primary object of my invention, therefore, is to provide a substitute for mica, ordinary sheet-metal, and other kinds of diaphragms heretofore employed, which substitute is durable and does not deteriorate, is resilient and resonant, is impervious to moisture and unaffected by climatic changes especially when coated, and is capable of giving out clear, loud, and distinct tones of great depth and volume, of evenly distributing the sound waves and making a quick, complete, and perfect recovery, and of less-

ening to a great extent all alien and discordant noises such as blasts and scratching sounds which are so prevalent with the ordinary diaphragm.

In the accompanying drawings, which form a part of this application and in which like characters of reference indicate like parts through the several views—Figure 1 is a side view of a sheet metal disk perforated and represents the unfilled diaphragm; Fig. 2, a view of a diaphragm as it appears when the burs left by the perforating punch have been upset or pressed into small bosses and when seen from the side upon which such bosses are located, the appearance being practically the same whether said diaphragm be filled and coated or not provided that, in the former instance, the coating be transparent; Fig. 3, an enlarged fragment in section of the disk or diaphragm shown in the first view, and, Fig. 4, an enlarged fragment in section of a diaphragm which has been filled and coated and pressed.

Various kinds of metals and their alloys which have been rolled or otherwise made thin can be utilized in the manufacture of my improved diaphragms, among which mention may be made of aluminum and copper, the former being an exceedingly good metal for the purpose. In addition to sheet-metals other materials which are sufficiently hard and dense and possess the other necessary qualities to a greater or less degree may be used, the materials being imporous when they are to be filled and coated.

In its simplest form the diaphragm consists of a disk 1, of aluminum for example, in which there are a number of small holes 2 therein. The holes 2 are more or less numerous, they extend through the disk 1 from side to side, and they are preferably punched rather than cut so as to leave projections or burs on one side of said disk, as shown at 3, in Fig. 3. The object of perforating the disk, and more especially of perforating it in the manner just stated, is for the purpose of breaking up the structure of the same and of obtaining the small bosses which are formed by flattening the aforesaid burs, as will presently be made clear, such changes in the character of the original disk being productive of beneficial results. A further object of the perforations may be to afford means for producing a structure of

different materials or a structure that consists of unlike parts in texture, as is done when the perforations are subsequently filled. This last phase of the invention will
5 be dealt with at length in the course of this description.

In some cases the burs 3 may be left intact, but usually they will be upset to form small, flat bosses 4. Figs. 2 and 4, on one side
10 of the disk 1 at the corresponding ends of the holes 2. In reality, the bosses 4 are necessarily somewhat irregular in shape, and the openings in their centers are often so exceedingly minute as scarcely to be discernible, but of course the metal, which has
15 been perforated by punching, when subjected to pressure in the upsetting process does not return to its former place or condition. In the drawings the holes 2, burs 3, and
20 bosses 4 are on an exaggerated scale. The disk 1 is pressed between steel plates or their equivalent to flatten the burs 3 into the bosses 4.

A more complex and perhaps in some respects better diaphragm than that previously described is made by filling and coating the perforated disk 1 with one or more suitable chemical substances or materials which are suitable for the purpose and give the desired
25 results, such as soluble minerals like plaster-of-paris, oxid of zinc, silicate of soda, etc. The filling and coating materials mentioned, while practical, are not the only ones that may be used successfully, and I do not, therefore, intend to be limited to them. The disk
30 1, with the holes 2 punched therein, is treated with a suitable filling and coating compound, solution, mixture, or emulsion, such consisting of silicate of soda or silicate of
35 potash and oxid of zinc, for example, which is introduced into said holes and spread on one or both sides of said disk, generally on both sides. The coating is usually applied several times, and the combined filling and
40 coating is set or fixed and rendered hard and otherwise fit to serve its purpose by subjecting the disk treated with it to pressure and heat. The burs 3 are transformed into

the bosses 4 by the pressure to which the disk is subjected. The diaphragm 5, Fig. 4, 50 embodies the features just described, the filling being represented at 6 and the coats on the two sides of the disk at 7. When the burs 3 are flattened the substance of the disk 1 is forced partly into the adjacent ends of
55 the holes or perforations 2 and into the filling when present, but enough remains outside to form the bosses 4. Wire-mesh, -cloth, or -gauze may be utilized for the disks, but in that case there will be no burs
60 or bosses.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. As a new article of manufacture, a diaphragm, for talking-machines, consisting of
65 a perforated disk having burs formed thereon, each bur surrounding the perforations at one end.

2. As a new article of manufacture, a diaphragm, for talking-machines, consisting of
70 a perforated disk having flattened burs thereon which form bosses, each of the latter surrounding its perforation at one end.

3. As a new article of manufacture, a diaphragm, for talking-machines, consisting of
75 a disk having perforations therein and bosses thereon which latter surround said perforations and partially fill the same.

4. As a new article of manufacture, a diaphragm, for talking-machines, consisting of
80 a disk having perforations therein which are filled with the material originally forced out to form such perforations, and with hardened filling material.

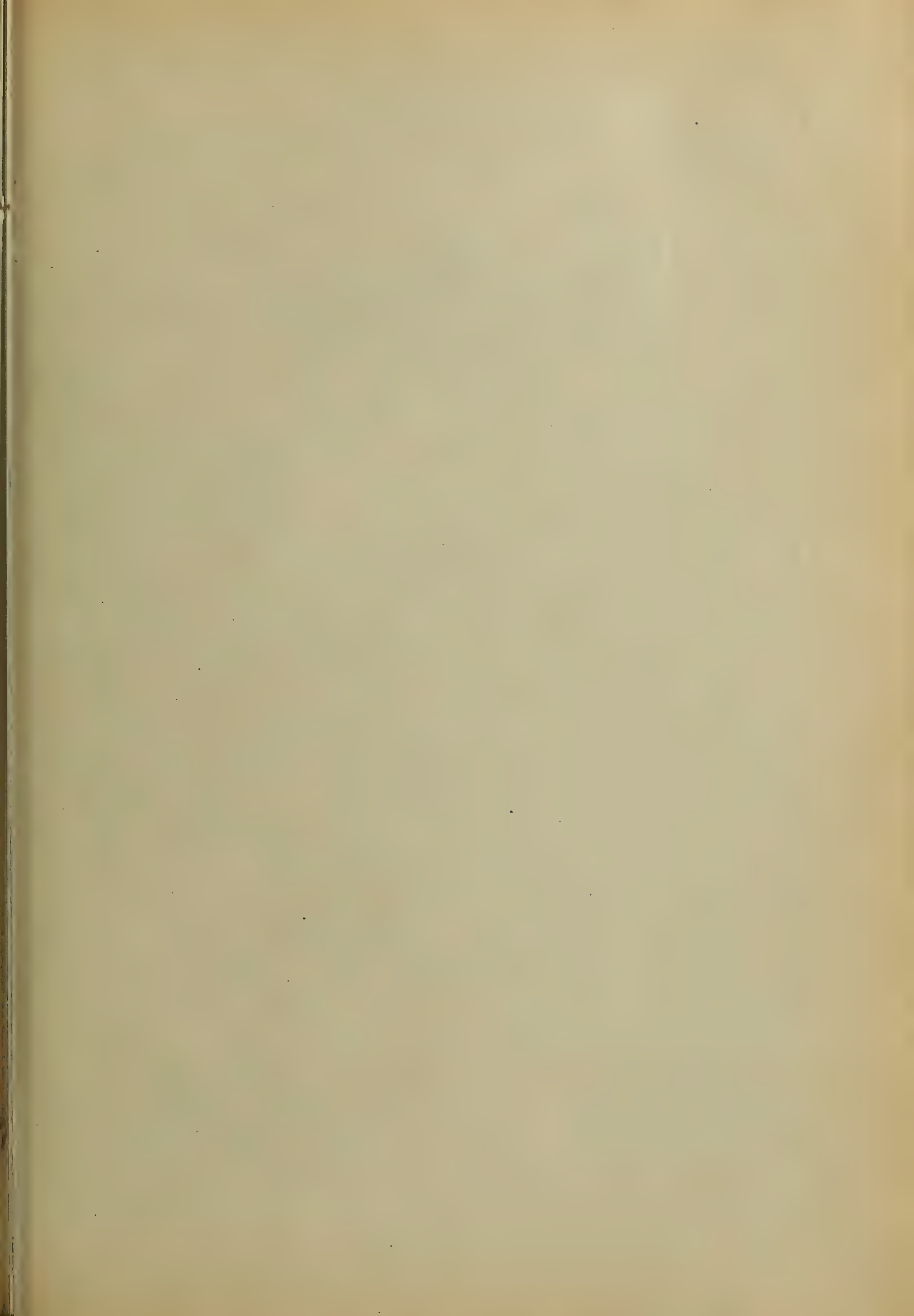
5. As a new article of manufacture, a diaphragm, for talking-machines, consisting of
85 a perforated metallic disk having bosses thereon surrounding the perforations therein at one end of each, hardened filling material in the perforations in said disk, and
90 hardened coating material on the outside of said disk.

WILLIAM W. YOUNG.

Witnesses:

F. A. CUTTER,

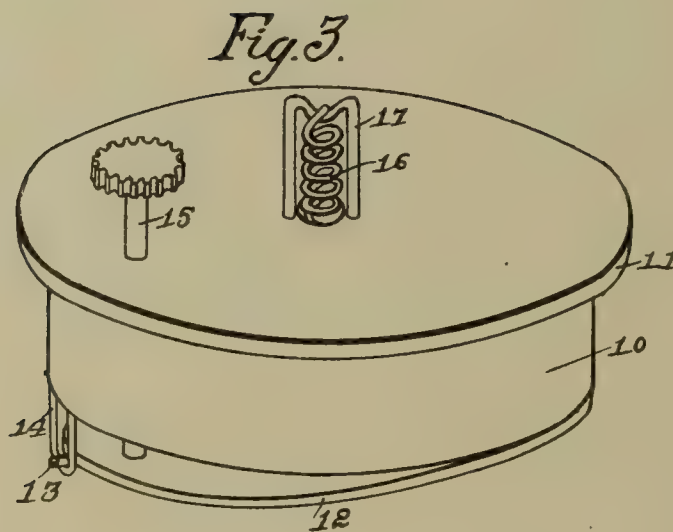
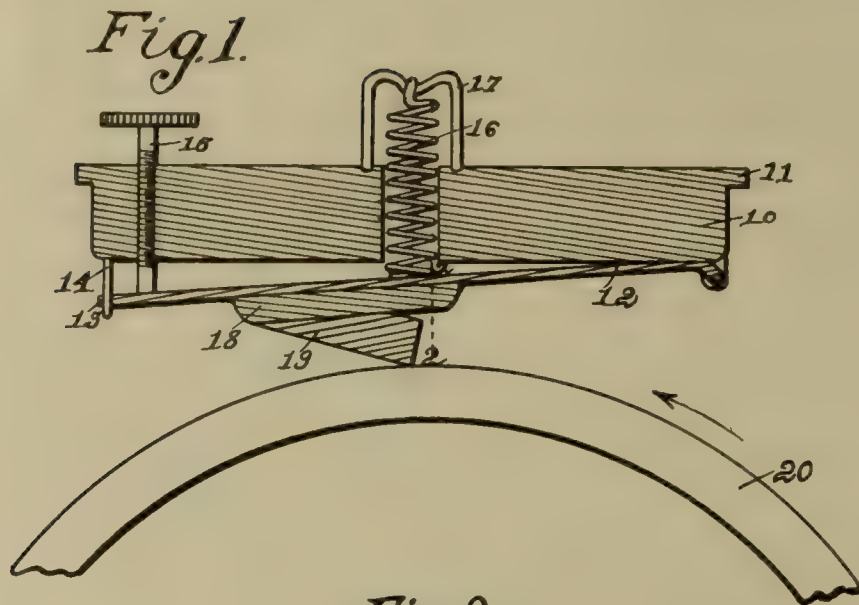
A. C. FAIRBANKS.



J. D. ROCKHILL.
 TRIMMER FOR PHONOGRAPH RECORDS.
 APPLICATION FILED AUG. 4, 1909.

974,435.

Patented Nov. 1, 1910.



Witnesses.
 W. A. Loftus.
 A. G. Hague

Inventor.
 J. D. Rockhill.
 by Orrig & Lane Attys

UNITED STATES PATENT OFFICE.

JOHN DAVID ROCKHILL, OF CONRAD, IOWA.

TRIMMER FOR PHONOGRAPH-RECORDS.

974,435.

Specification of Letters Patent.

Patented Nov. 1, 1910.

Application filed August 4, 1909. Serial No. 511,229.

To all whom it may concern:

Be it known that I, JOHN DAVID ROCKHILL, a citizen of the United States, residing at Conrad, in the county of Grundy and State of Iowa, have invented a certain new and useful Trimmer for Phonograph-Records, of which the following is a specification.

My invention is designed to be used in the nature of an attachment that may be readily, quickly, and easily attached to or detached from an ordinary phonograph in place of the cylindrical frame that contains the reproducing instrument.

My object is to provide a trimming device of this kind, of simple, durable and inexpensive construction that may be readily and quickly adjusted to trim off the records to any depth of cut desired; and, more specifically, it is my object to provide a cutting tool of such shape and size as to trim a phonograph record without chipping or breaking the record, to thereby properly prepare a record for use in such a manner that its surface is well adapted for receiving impressions.

My invention consists in the construction, arrangement, and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which—

Figure 1 shows a central, sectional view of a device embodying my invention, the cutting tool being shown in engagement with a portion of a phonograph record. Fig. 2 shows a sectional view on the line 2— of Fig. 1, and Fig. 3 shows a perspective view of the frame for holding the trimming tool.

Referring to the accompanying drawings, I have used the reference numeral 10 to indicate the supporting frame of the trimming device. This supporting frame is preferably cylindrical in shape and comprises a body portion 10 with a flange 11 at its top. The said body portion is preferably made of the same size and shape as the body portion of the frame that holds the reproducing instrument of the phonograph with which the device is to be used. In this connection, it is obvious that by the use of a frame of this kind, the operator may readily and easily remove the reproducing instrument from a phonograph and then place the frame of the trimming instrument in the position for-

merly occupied by the reproducer, and then the other parts of the phonograph may be operated in the ordinary way and the trimmer will operate to prepare a phonographic record for use. In this way the expense of a separate instrument for turning the record and advancing the trimmer is dispensed with.

Pivoted to the under surface of the body portion 10 is a disk 12 having a projection 13 at the side opposite from the pivotal point, which projection is placed in a guide loop 14 connected to the body portion 10 to thereby limit the lateral movement of said disk. Seated in the body portion 10 is an adjusting screw 15 having its lower end designed to engage the disk 12 to limit its forward movement. Connected to the central portion of the disk 12 is a contractible coil spring 16 attached at its upper end to a support 17 connected to the body portion, so that the said disk 12 is yieldingly held upwardly against the adjusting screw 15.

Fixed to the disk 12 is a block 18 having the cutting tool 19 applied thereto. This cutting tool is extended downwardly and in a direction toward the hinged end of the disk 12, the angle of the end surface of the cutting tool being such that it will form an acute angle relative to the phonograph record with which it is to be used, as clearly illustrated in Fig. 1 of the drawings. The body portion of the cutting tool at the lower end thereof is approximately round in cross section, as clearly illustrated in Fig. 2, and the end thereof is arranged at an angle slightly deviating from a vertical line, with the lower portion inclined away from a vertical line in a direction toward the body of the cutting tool, as clearly shown in Fig. 1.

The portion of the phonograph record shown is indicated by the reference numeral 20 and the direction of its movement relative to the cutting tool is indicated by an arrow in Fig. 1; that is to say, the end of the cutting tool is so shaped that it will form an acute angle relative to that portion of the phonograph record with which it is used which is traveling in a direction toward the cutting tool. The diameter of the cutting tool at its end is greatly in excess of the width of the spaces between the various spiral lines on the record over which the reproducing instrument passes so that with each operation of the cutting tool, a number of spiral lines on the record are covered, and

inasmuch as the cutting tool travels in the same path as the reproducing instrument, it is obvious that the various paths which the cutting tool makes will overlap each other and this will result in producing a finished record comparatively smooth and even.

In practical use and assuming that it is desired to trim a record, the operator simply detaches the body portion of the frame that contains the reproducing instrument and substitutes for it the body portion 10 of the trimming device. Then the record is placed on the mandrel of the phonograph and the phonograph is operated in the ordinary way. By having the end of the cutting tool rounded on its lower surface, it is obvious that when it cuts into the record, it will not have any sharp corners that would tend to chip or break out portions of the record with which it comes in contact. Furthermore, by having the end of the cutting tool inclined at an acute angle relative to that portion of the record which is moving in a direction toward it, the cutting tool will tend to scrape the record as distinguished from cutting the record, and there will be no tendency for the cutting tool to chip or break out the portions of the record with which it comes in contact as would be the case if the cutting end of the tool were arranged at an obtuse angle relative to the part of the record that was moving toward it. The rounded lower edge of the tool, together with the scraping operation which it accomplishes, makes it possible for the device to operate with a minimum of applied power, hence the power of an ordinary phonographic instrument is sufficient to operate the trimmer. By means of the adjusting screw, the depth to which the cutting tool enters the record may be quickly and easily adjusted, and the spring 16 will tend to hold the disk that supports the cutting tool in an elevated position against the adjusting screw.

I claim as my invention:

1. A device for trimming phonographic records, comprising a substantially circular body portion designed to be detachably supported in a phonograph in place of the circular frame usually employed for support-

ing the phonographic reproducing instrument, a disk pivoted at one edge to the under surface of said body portion, an adjusting screw mounted in the body portion to engage the free end of the disk for adjusting its position relative to the body portion and for holding it away from the body, a spring connected to the disk and extended through the body portion to yieldingly hold the disk upwardly against said adjusting screw, and a cutting tool fixed to the under surface of the disk substantially circular in cross section and extended at an acute angle relative to the central portion of the disk, the cutting edge of said tool being substantially round and being inclined at an angle slightly less than a right angle relatively to the lower surface of the cutting tool, for the purposes stated.

2. A device for trimming phonographic records, comprising a substantially circular body portion designed to be detachably supported in a phonographic instrument in place of the circular frame usually employed for supporting the phonographic reproducing instrument, a disk pivoted at one edge to the under surface of said body portion and having a projection at its opposite edge, a guide loop fixed to the body portion to receive said projection, an adjusting screw mounted in the body portion to engage said disk, a contractible spring fixed to the central portion of the disk and extended through said body portion, a support for said spring fixed to the body portion, and a cutting tool fixed to the under portion of the disk substantially circular in cross section and extended at an acute angle relative to the central portion of the disk, the cutting end of said tool being substantially round and being inclined at an angle slightly less than a right angle relatively to the lower surface of the cutting tool, for the purposes stated.

Des Moines, Iowa, July 15, 1909.

JOHN DAVID ROCKHILL.

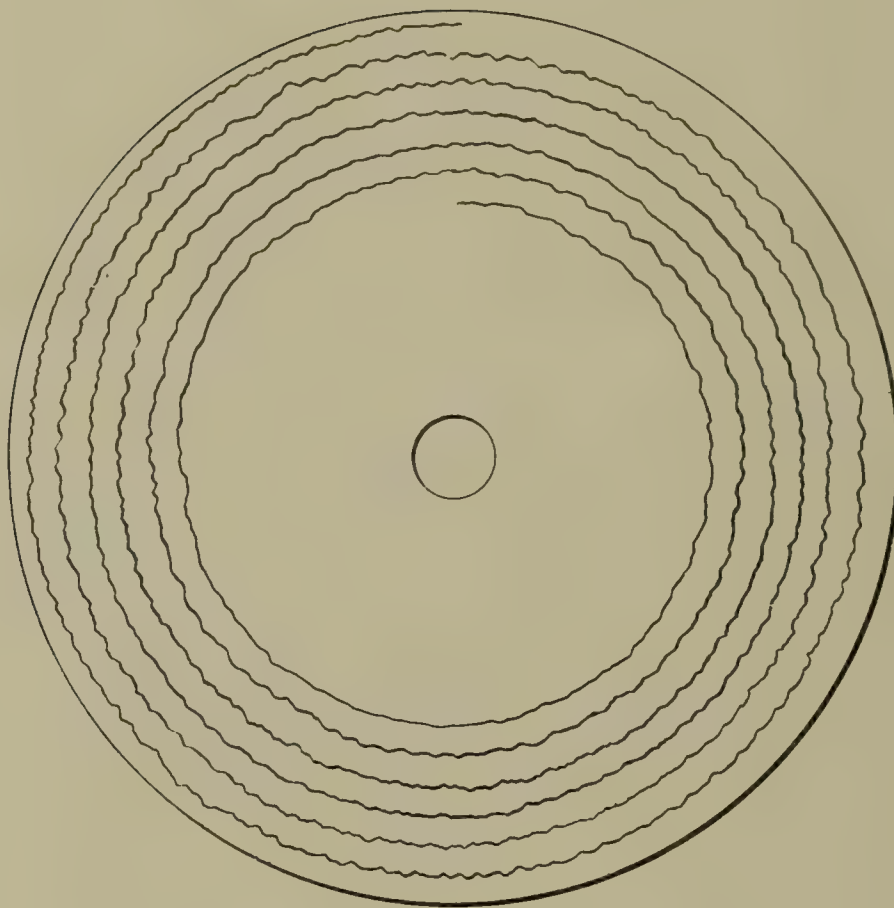
Witnesses:

WM. A. SANDOE,
E. W. SCHWIELERT.

E. F. LEEDS.
PHONAUTOGRAPHIC RECORD AND PROCESS OF DUPLICATING THE SAME.
APPLICATION FILED MAR. 5, 1906.

974,895.

Patented Nov. 8, 1910.



WITNESSES

Frank J. Aquatest
Annie J. Irvine

Edward F. Leeds INVENTOR

BY

Levin H. H. H. ATTORNEY

UNITED STATES PATENT OFFICE.

EDWARD F. LEEDS, OF NEW YORK, N. Y.

PHONAUTOGRAPHIC RECORD AND PROCESS OF DUPLICATING THE SAME.

974,895.

Specification of Letters Patent.

Patented Nov. 8, 1910.

Application filed March 5, 1906. Serial No. 304,418.

To all whom it may concern:

Be it known that I, EDWARD F. LEEDS, a citizen of the United States, residing in the borough of Brooklyn, city and State of New York, have invented certain new and useful Improvements in Phonautographic Records and Processes of Duplicating the Same, of which the following is a specification.

This invention relates to phonautographic records and to a new method of duplicating phonautographic records or copying the same in solid resisting material, and has for its object the treatment of phonautographic records as herein described and the production of duplicates or copies thereof superior to those heretofore produced.

In the accompanying drawing forming part of this specification is a plan view of a phonautographic record of lateral undulations and practically uniform depth made in accordance with this invention.

The characteristics of an original, phonautographic record and of a duplicate thereof are the same, except as to the material in which the record-groove is formed.

Phonautographic records have heretofore been produced by the lateral vibrations of a recording stylus in a layer or coating of a comparatively non-resisting material, that is a material offering but little resistance to the movements of the recording stylus and carried or spread upon a surface of a tablet or support. Through the removal of the material upon the surface of the tablet or support by the laterally vibrating end or point of the recording stylus, a phonautographic record is traced in the form of an undulatory line of even depth.

As used in the description and claims of this specification, the expression "phonautographic record" applies only to laterally undulating records of substantially even depth. Such phonautographic records have heretofore been traced or produced in a manner such as that above described in a layer or coating of lamp-black, or of beeswax, paraffin or other like substance dissolved in a suitable solvent, or of semi-fluid ink, or of other suitable non-resisting material, carried or spread upon the surface of the tablet or support.

As is well known, an original phonautographic record formed in non-resisting material is incapable of use for reproduction of sound directly therefrom, since the non-re-

sisting material in which it is formed has not sufficient resistance to cause a reproducing stylus to be vibrated and thereby to cause the sounds originally recorded to be reproduced. For this reason such phonautographic records must be copied in solid resisting material in order to reproduce sound therefrom.

The expression "non-resisting material" has long been used in this art, and is used in the description and claims of this specification, to mean a recording material that offers a very small or minimum resistance to the recording stylus and not sufficient resistance to a reproducing stylus to cause it to be vibrated and the sounds originally recorded to be reproduced.

The tablet or support has been made in the form of a revoluble drum or cylinder but more often and preferably in the form of a flat rotary disk or tablet. The tablet or support has been made of paper, parchment, metal, glass or other suitable substance. Negatives, duplicates or copies of such phonautographic records, in solid resisting material, have heretofore been made by the purely mechanical process of engraving, or by chemical deposition, or by photo-engraving, or by the process of direct etching. In the making of negatives, duplicates or copies of such phonautographic records, by such processes, difficulties have been encountered and the results obtained have not been satisfactory. In the making of a negative of such phonautographic record by the process of chemical deposition, for example, the layer or coating of lamp-black or other material, which is spread upon a surface of the tablet or support and in which the undulatory line of even depth has been traced to form the phonautographic record, tends to separate, and at times does separate from the tablet or support when the same have been placed in the electrical bath. It will be understood by those skilled in the art that when a phonautographic record has been traced in a layer or coating of lamp-black, or other suitable material above described, spread or carried upon the surface of a tablet or support, the removal of the lamp-black or other material by the vibrating end or point of the recording stylus exposes, in some instances, the surface of the paper, parchment, metal, glass or other suitable material of which the tablet or support consists, so that the pho-

5 nautographic record thus traced in the form
 of an undulatory line of even depth has for
 the bottom of the groove or furrow the sur-
 face of the tablet or support, and for the
 10 sides or walls of the groove or furrow the
 material, such as lamp-black, beeswax, par-
 affin or other like substance dissolved in a
 suitable solvent, and the like, of which the
 layer or coating spread upon the surface of
 15 the tablet or support consists. In other in-
 stances, the surface of the support is not ex-
 posed and the phonautographic record has
 for the bottom, as well as for the sides, of
 the groove, the non-resisting material in
 20 which the record has been traced. Where
 the tablet or support has been made of ma-
 terial such as glass, difficulty has been ex-
 perimented in depositing, by chemical deposi-
 tion, upon such material, metal for the
 25 formation of a negative or copy—a difficulty
 not overcome by spreading upon the surface
 of such material any of the agents heretofore
 used to make the surface electrically con-
 ductive. By reason especially of the delicate
 30 nature of the material in which the phonau-
 tographic record is traced, because of the
 character of the material of which the tablet
 or support upon which it is spread consists,
 and because of the separation from the tablet
 35 or support of the material spread upon it,
 when placed in the electrical bath, and for
 other like reasons, in the circumstances of
 any particular case, great difficulty has been
 encountered in the making, by the process of
 40 chemical deposition, of a negative, for the
 duplication or copying of a phonautographic
 record in solid resisting material, or other
 copy of a phonautographic record, and the
 results obtained have been unsatisfactory.

40 I have discovered that if a film of metal,
 such as gold, silver or platinum, preferably
 gold, is deposited in the form of a vapor of
 the metal, in any well known manner, upon
 the surface of the phonautographic record,
 45 as by changing the condition of the metal to
 the form of a vapor by means of an electrical
 current in a vacuum in which the phonau-
 tographic record is present, a perfect negative
 matrix of the original phonautographic rec-
 50 ord can thus be made and backed up, so as to
 be self sustaining, by the process of chemical
 deposition, in the usual manner, and such
 perfect negative can then be used as a die or
 stamp with which to press duplicates or
 55 copies of the original phonautographic rec-
 ord into suitable material for the reproduc-
 tion of the original sound waves, or as a
 matrix from which, by means of chemical
 deposition, to make duplicates or copies of
 60 the original phonautographic record, either
 for the reproduction of the original sound
 waves or for the making of other negatives
 by chemical deposition to be used as stamps
 or dies to impress duplicate copies of the
 65 original record into suitable material; or the

said original and first negative matrix may
 be pressed into a tablet of wax or other suit-
 able material and further negatives may be
 made by chemical deposition upon the im-
 pression in wax or in other suitable material; 70
 or any of the said negatives, or duplicates
 or copies may be used for analogous pur-
 poses either according to the method of this
 invention or according to other methods
 heretofore known according to the condi- 75
 tions or requirements of the case.

The negative matrix, formed of the vacu-
 ous deposit of a metal such as gold, is so
 delicate and soft that it is not adapted to be
 used as a stamp or die for the commercial 80
 production of duplicates of the original rec-
 ord by impressing it into hard, resisting
 material, such as compositions of shellac and
 earth ordinarily used for such purpose, and
 I, therefore, prefer to employ such negative 85
 matrix as a means of obtaining, by chemical
 deposition, as stated, a positive duplicate or
 copy of the original record from which a
 negative, stamping die may, by chemical
 deposition, be obtained in hard metal, as 90
 described.

Heretofore negatives, duplicates or copies
 of phonautographic records have not been
 successfully produced by the process of
 chemical deposition, principally because of 95
 the difficulties above mentioned and referred
 to. The process of chemical deposition has,
 heretofore, been used for the making of
 matrices, molds, duplicates or copies of rec-
 100 ords cut or engraved in wax or in a wax-like
 substance, of considerable resistance to the
 vibrations of the recording stylus. Such
 records are known as phonograph records
 or graphophone records and are to be dis-
 105 tinguished from the phonautographic rec-
 ords traced, as above described, in nonresist-
 ing material.

Phonograph or graphophone records
 which are cut or engraved, as stated, in wax
 or a wax-like substance, of considerable re- 110
 sistance to the vibrations of the recording
 stylus, are capable of use for reproduction
 of sound directly therefrom, since the resist-
 ing material, in which they are cut or en-
 115 graved by the vertical or lateral vibrations
 of the recording stylus, has sufficient resist-
 ance to cause a reproducing stylus to be
 vibrated and thereby to cause the sounds
 originally recorded to be reproduced. The
 resisting material, moreover, in which pho- 120
 nograph and graphophone records have been
 cut or engraved, is capable of withstanding
 the treatment necessary to make, by electrol-
 ysis, a chemical deposition of metal thereon,
 in order to obtain a matrix or a stamping 125
 die, without the danger of injury to or de-
 struction of the original record, which exists
 in the case of the phonautographic record
 traced in a delicate, non-resisting material.

Experience has taught that in the making 130

of matrices, by chemical deposition, from records cut into wax or other like resisting material, it is advisable to coat the surface of the matrix, when it is to be used as a
 5 stamping die, with a comparatively slight deposit of nickel. The deposit of nickel has the advantage of hardening the surface of the matrix. In the making of duplicates or
 10 copies of phonautographic records, according to my invention, a deposit of nickel should, preferably, be made, by chemical deposition, when a stamping die is being
 15 formed; but the deposit of nickel should preferably be made before the deposit of copper or other suitable metal, so that the copper is deposited upon the nickel and not the nickel upon the copper as has been the
 20 practice heretofore. In depositing copper or other suitable metal upon nickel, the trouble and difficulty, experienced in depositing nickel upon copper, for instance, that
 25 of cleansing and preparing the surface of the copper, will not be encountered, as will be well understood by those skilled in the art of chemical deposition, and what is of
 30 more importance, by depositing nickel directly upon the surface to be duplicated, the nickel forms a more accurate negative thereof than it does when deposited as a coating
 35 upon a negative surface already obtained by deposit of metal upon the surface to be duplicated. In other words the surface of the deposited nickel, which is next to the surface upon which it was deposited, is a
 40 more exact negative thereof, when separated therefrom, than is the other surface a copy thereof.

From the foregoing description of my invention it will be understood that phonautographic records traced in a layer or coating
 45 of suitable non-resisting material carried upon the surface of a tablet or suitable support can, according to my invention, be duplicated and copied in solid resisting and
 50 other material.

It will, of course, be further understood that the vapor of suitable material deposited in a film upon the surface of the phonautographic record is electrically conductive;
 55 also that any hard metal, such as iron, may be used in place of nickel, to harden the surface of the matrix or negative of the phonautographic record and to make the surface more durable and resistant.

Having described my invention, which is the result of repeated trial and experiment, what I claim is;—

1. A phonautographic record, formed in comparatively non-resisting material incapable
 60 of vibrating a stylus and reproducing sound, provided upon its surface with a film of the vapor of an electrically conductive material, substantially as described.

2. A phonautographic record, formed in
 65 comparatively non-resisting material inca-

pable of vibrating a stylus and reproducing sound, provided upon its surface with a film of the vapor of metal, substantially as described.

3. A phonautographic record, formed in
 70 comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, provided upon its surface with a film of the vapor of gold, substantially as described.
 75

4. A phonautographic record, formed in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, transferred to suitable resisting material and provided upon its surface with a
 80 film of the vapor of an electrically conductive material, substantially as described.

5. A phonautographic record, formed in comparatively non-resisting material incapable of vibrating a stylus and reproducing
 85 sound, transferred to suitable resisting material and provided upon its surface with a film of the vapor of metal, substantially as described.

6. A phonautographic record, formed in
 90 comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, transferred to suitable resisting material and provided upon its surface with a film of the vapor of gold, substantially as
 95 described.

7. The process of duplicating phonautographic records, which consists in forming a phonautographic record in comparatively
 100 non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of an electrically conductive material, then, by
 105 chemical deposition, depositing suitable material upon the film, then separating the negative so formed from the phonautographic record, and finally pressing the negative into a tablet of suitable material, substantially as described.
 110

8. The process of duplicating phonautographic records, which consists in forming a phonautographic record in comparatively
 115 non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of an electrically conductive material, then, by chemical deposition, depositing metal upon the film, then separating the negative so
 120 formed from the phonautographic record, and finally pressing the negative into a tablet of suitable material, substantially as described.

9. The process of duplicating phonautographic records, which consists in forming a
 125 phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonauto-
 130

graphic record a film of the vapor of metal, then, by chemical deposition, depositing suitable material upon the film, then separating the negative so formed from the
5 phonautographic record, and finally pressing the negative into a tablet of suitable material, substantially as described.

10. The process of duplicating phonautographic records, which consists in forming a
10 phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of gold,
15 then, by chemical deposition, depositing suitable material upon the film, then separating the negative so formed from the phonautographic record, and finally pressing the negative into a tablet of suitable material, substantially as described.
20

11. The process of duplicating phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of metal, then, by chemical deposition, depositing metal upon the film, then separating the
30 negative so formed from the phonautographic record, and finally pressing the negative into a tablet of suitable material, substantially as described.

12. The process of duplicating phonautographic records, which consists in forming a
35 phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of metal, then, by chemical deposition, depositing nickel upon the film, then, by chemical deposition, depositing metal upon the nickel, then separating the negative so formed from
40 the phonautographic record, and finally pressing the negative into a tablet of suitable material, substantially as described.
45

13. The process of forming a negative for the duplicating of phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic
50 record a film of the vapor of an electrically conductive material, then, by chemical deposition, depositing suitable material upon the film, substantially as described.
55

14. The process of forming a negative for the duplicating of phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing
60 upon the surface of the phonautographic

record a film of the vapor of metal, then, by chemical deposition, depositing metal upon the film, substantially as described.

15. The process of duplicating phonautographic records, which consists in forming a
70 phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of an
75 electrically conductive material to form a matrix, then, by chemical deposition, depositing suitable material upon the film, then separating the negative matrix so formed from the phonautographic record, then forming, by chemical deposition, from
80 the matrix a positive, and from the positive a negative, copy of the original record, and finally pressing the second negative into a tablet of suitable, resisting material, substantially as described.
85

16. The process of duplicating phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of an electrically conductive material to form a matrix, then, by chemical deposition, depositing nickel upon the film, then separating the negative matrix so formed from the phonautographic record, then forming, by chemical deposition, from the matrix a positive, and from the positive a negative, copy
90 of the original record, and finally pressing the second negative into a tablet of suitable resisting material, substantially as described.
95

17. The process of duplicating phonautographic records, which consists in forming a
105 phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of an electrically conductive material to form a matrix, then, by chemical deposition, depositing metal upon the film, then separating the negative matrix so formed from the phonautographic record, then forming, by
110 chemical deposition, from the matrix a positive, and from the positive a negative, copy of the original record, and finally pressing the second negative into a tablet of suitable resisting material, substantially as described.
115

18. The process of duplicating phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of metal to form a matrix, then, by chemical deposition, depositing metal upon the film, then separating the negative matrix so formed
120
125
130

from the phonautographic record, then forming, by chemical deposition, from the matrix a positive, and from the positive a negative, copy of the original record, and finally pressing the second negative into a tablet of suitable resisting material, substantially as described.

19. The process of duplicating phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of gold to form a matrix, then, by chemical deposition, depositing metal upon the film, then separating the negative matrix so formed from the phonautographic record, then forming, by chemical deposition, from the matrix a positive, and from the positive a negative, copy of the original record, and finally pressing the second negative into a tablet of suitable resisting material, substantially as described.

20. The process of forming a negative for the duplicating of phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of an electrically conductive material to form a matrix, then depositing metal upon the film, then separating the negative matrix so formed from the phonautographic record, and then forming, by chemical deposition, from the matrix a positive, and from the positive a negative, copy of the original record, substantially as described.

21. The process of forming a negative for the duplicating of phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of metal to form a matrix, then depositing, by chemical deposition, metal upon the film, then separating the negative matrix so formed from the phonautographic record, and then forming, by chemical deposition, from the matrix a positive, and from the positive a negative, copy of the original record, substantially as described.

22. The process of forming a negative for the duplicating of phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of gold to form a matrix, then, by chemical deposition, depositing metal upon the film, then separating the

negative matrix so formed from the phonautographic record, and then forming, by chemical deposition, from the matrix a positive, and from the positive a negative, copy of the original record, substantially as described.

23. The process of forming a negative for the duplicating of phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of metal, then, by chemical deposition, depositing metal upon the film, then separating the negative so formed from the phonautographic record, and finally, by chemical deposition, depositing nickel upon the surface of the negative, substantially as described.

24. The process of duplicating phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of an electrically conductive material to form a matrix, then depositing suitable material upon the film, then separating the negative matrix so formed from the phonautographic record, then forming, by chemical deposition, from the matrix a positive, then, by chemical deposition, depositing hard metal upon the surface of the positive to form a negative, and finally pressing the second negative into a tablet of suitable resisting material, substantially as described.

25. The process of duplicating phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of an electrically conductive material to form a matrix, then, by chemical deposition, depositing metal upon the film, then separating the negative matrix so formed from the phonautographic record, then forming, by chemical deposition, from the matrix a positive, then, by chemical deposition, depositing nickel upon the surface of the positive to form a negative, and finally pressing the second negative into a tablet of suitable resisting material, substantially as described.

26. The process of duplicating phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of metal to form a matrix, then, by chemical deposition, depositing suitable material upon the

film, then, separating the negative matrix so formed from the phonautographic record, then forming, by chemical deposition, from the matrix a positive, then, by chemical deposition, depositing nickel upon the surface of the positive to form a negative, and finally pressing the second negative into a tablet of suitable resisting material, substantially as described.

27. The process of duplicating phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of gold to form a matrix, then, by chemical deposition, depositing metal upon the film, then separating the negative matrix so formed from the phonautographic record, then forming, by chemical deposition, from the matrix a positive, then, by chemical deposition, depositing hard metal upon the surface of the positive to form a negative, and finally pressing the second negative into a tablet of suitable resisting material, substantially as described.

28. The process of duplicating phonautographic records, which consists in forming a phonautographic record in comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the phonautographic record a film of the vapor of metal, then, by chemical deposition, depositing metal upon the film, then separating the negative so formed from the phonautographic record, then, by chemical deposition, depositing nickel upon the surface of the negative, and finally pressing the negative into a tablet of suitable material, substantially as described.

29. The process of duplicating phonautographic records traced in comparatively non-resisting material, incapable of vibrating a stylus and reproducing sound, spread upon a vitreous surface, which consists in depositing upon the surface of the phonautographic record a film of the vapor of an electrically conductive material, then, by chemical deposition, depositing suitable material upon the film, then separating the negative so formed from the phonautographic record, and finally pressing the negative into a tablet of suitable material, substantially as described.

30. The process of duplicating phonautographic records traced in comparatively non-resisting material, incapable of vibrating a stylus and reproducing sound, spread upon the surface of glass, which consists in depositing upon the surface of the phonautographic record a film of the vapor of an electrically conductive material, then, by chemical deposition, depositing metal upon the film, then separating the negative so

formed from the phonautographic record, and finally pressing the negative into a tablet of suitable material, substantially as described.

31. The process of duplicating phonautographic records traced in comparatively non-resisting material, incapable of vibrating a stylus and reproducing sound, spread upon a vitreous surface, which consists in depositing upon the surface of the phonautographic record a film of the vapor of metal, then, by chemical deposition, depositing suitable material upon the film, then separating the negative so formed from the phonautographic record, and finally pressing the negative into a tablet of suitable material, substantially as described.

32. The process of duplicating phonautographic records traced in comparatively non-resisting material, incapable of vibrating a stylus and reproducing sound, spread upon the surface of glass, which consists in depositing upon the surface of the phonautographic record a film of the vapor of gold, then, by chemical deposition, depositing suitable material upon the film, then separating the negative so formed from the phonautographic record, and finally pressing the negative into a tablet of suitable material, substantially as described.

33. The process of duplicating phonautographic records traced in comparatively non-resisting material, incapable of vibrating a stylus and reproducing sound, spread upon the surface of glass, which consists in depositing upon the surface of the phonautographic record a film of the vapor of metal, then, by chemical deposition, depositing metal upon the film, then separating the negative so formed from the phonautographic record, and finally pressing the negative into a tablet of suitable material, substantially as described.

34. A negative of a phonautographic record formed in a comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, consisting of a layer of suitable material provided with a film of the vapor of suitable material, substantially as described.

35. A negative of a phonautographic record formed in a comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, consisting of a layer of suitable material, a layer of nickel and a film of the vapor of suitable material, substantially as described.

36. The process of making a negative matrix of a sound-record, which consists in forming the sound-record in a comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the record a film of the vapor of metal, then backing up the metal film, and then sep-

arating the negative matrix from the original record, substantially as described.

37. The process of making a negative matrix of a sound-record, which consists in
5 forming the sound-record in a comparatively non-resisting material incapable of vibrating a stylus and reproducing sound, then depositing upon the surface of the record a film of the vapor of gold, then
10 backing up the metal film, and then sep-

arating the negative matrix from the original record, substantially as described.

In witness whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD F. LEEDS.

Witnesses:

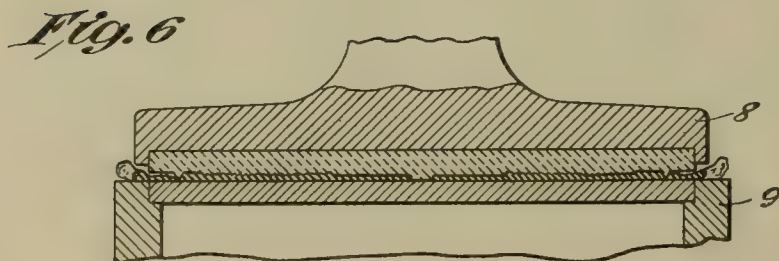
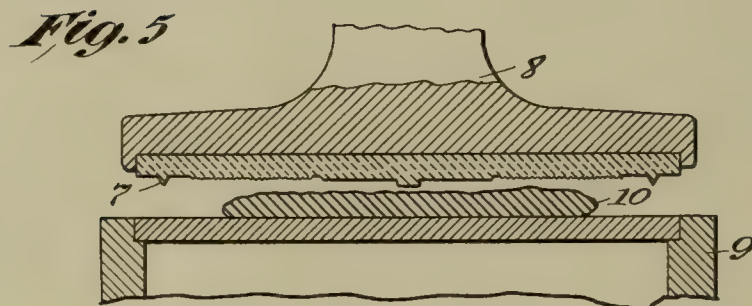
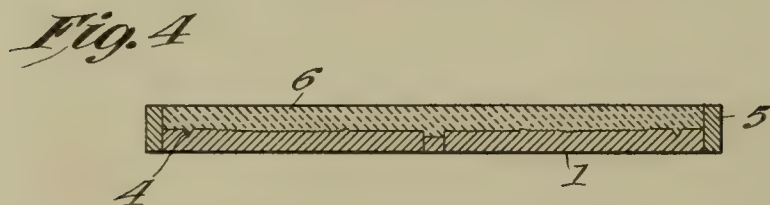
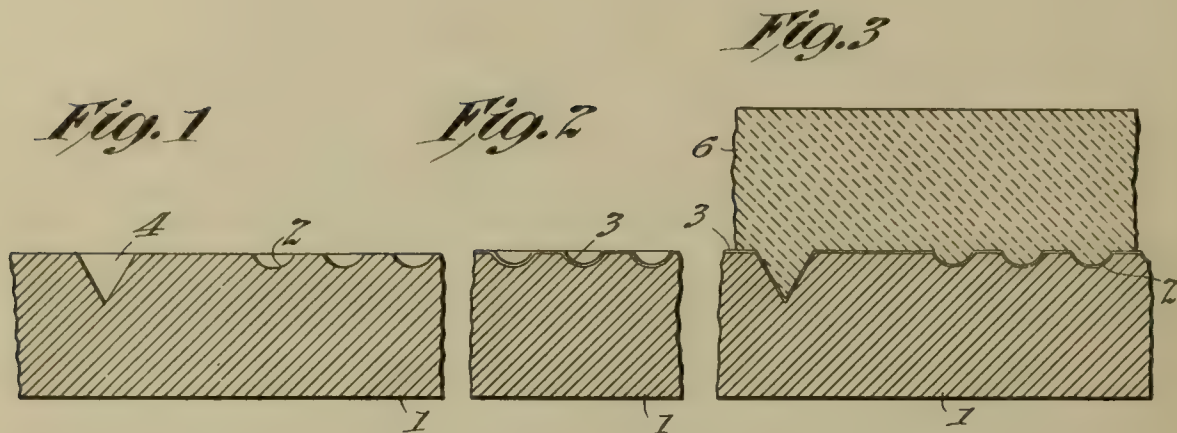
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T. A. EDISON.
 PROCESS OF DUPLICATING TALKING MACHINE RECORDS.
 APPLICATION FILED MAR. 4, 1907.

975,339.

Patented Nov. 8, 1910.



Witnesses:
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UNITED STATES PATENT OFFICE.

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PROCESS OF DUPLICATING TALKING-MACHINE RECORDS.

975,339.

Specification of Letters Patent.

Patented Nov. 8, 1910.

Application filed March 4, 1907. Serial No. 360,313.

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, and a resident of Llewellyn Park, Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Processes of Duplicating Talking-Machine Records, of which the following is a description.

My invention relates to an improved process for duplicating talking machine records of the disk type and preferably in which the record itself exists as a sinuous groove cut or otherwise formed in a wax-like material by the action of a suitable stylus actuated by sound waves and vibrating in a plane parallel with the recording surface. At present such records are duplicated by first coating the original master with extremely finely divided graphite and electroplating the same to form a matrix, which is then separated from the master and employed to impress a suitable hot plastic material which, during the pressing operation, takes the proper disk-like form. Such a process is objectionable on account of the expense of making the matrices by electroplating and the uncertainty of that operation. Furthermore, in separating the matrix from the master the latter is generally broken or its record surface injured, and since the life of the matrix is not long, the surface being in a short time affected by the hot plastic material, it becomes necessary, before a fresh matrix can be secured, to make a new master, which is expensive and tedious.

The objects of my invention are to provide a very cheap and effective process for the purpose, in which electro-plating is dispensed with, and a very superior and durable matrix is secured so that the resulting duplicates are of a high order. Furthermore, in the separation of the matrix, the surface of the master will not be injured in the slightest degree, so that the master may be preserved indefinitely and any desired number of matrices made therefrom.

Broadly stated the improved process consists in first coating a suitable master (obtained by recording upon a wax-like blank in any suitable and ordinary way) with an excessively thin layer of extremely finely divided material that is not greatly water repellent, if at all, then in flowing over the record surface an emulsion of an extremely

finely divided cement, preferably Portland cement, then in allowing the cement to set so as to form a perfect matrix of the record surface, then in separating the matrix from the master, and in finally obtaining duplicate copies from the matrix, preferably by impressing the same upon and into a suitable hot plastic material, as with the art as now practiced with electro-plated matrices.

In order that the invention may be better understood, attention is directed to the accompanying drawings forming part of this specification, and in which—

Figure 1 represents a section of a part of the master on a greatly enlarged scale; Fig. 2, a similar view on the same scale, of the same, showing the preliminary coating; Fig. 3, a similar view on the same scale, illustrating the cement material in position before separating the matrix from the master; Fig. 4, a similar view, on a much smaller scale, illustrating more clearly the casting of the matrix; Fig. 5, a similar view showing the matrix in position to impress the hot plastic material, and Fig. 6, a similar view after the impression has been effected.

In the above views corresponding parts are represented by the same numbers.

The master 1 is of the usual type, being formed of a suitable wax-like composition, preferably one employing stearate of soda, and it carries the helical record groove 2 formed by means of any suitable stylus actuated by sound vibrations. The record 2 exists preferably as a sinuous groove as in the ordinary disk records of the present day, but it may be of any other suitable form. Having obtained a suitable master, I proceed to coat the same with a material that is not greatly water repellent, so as to permit the cement emulsion to flow regularly over the same and take a perfect impression. Obviously this layer 3 should be excessively thin so as not to appreciably fill up the record groove, and its particles should be excessively fine so as not to make the matrix rough. A material adequately meeting these conditions is extremely finely divided graphite such as now used for coating the master to form a conducting film, and which may be applied to the surface and thoroughly and carefully rubbed therein. Instead of graphite the master may be coated with gold, or other suitable metal, by a process of vacuum deposit, as in connection with the manufacture of molds from phonograph records. See

my Patent No. 713,863, granted November 18, 1902. Preferably the master 1 is formed with a concentric V shaped groove 4, surrounding the record and defining the periphery of the completed article as will be explained hereafter, said groove being of enormous depth compared with the record groove. The master as so coated and formed is now surrounded by a ring or flange 5 and over the record surface I flow a thick emulsion of a suitable hard and smooth cement 6, the uniform and perfect distribution of the cement being possible by reason of the coating 2. I prefer for this purpose, Portland cement reduced to an impalpable powder since the resulting matrix will be extremely hard—harder in fact than an electro-plated matrix; it will be practically unaffected by the hot plastic material, and its surface will be excessively smooth and glazed, so as to permit very perfect records to be impressed therefrom. Other cements may however be used which will not be affected by the hot material, such as oxychlorid of zinc and magnesia; or if rapid manufacture is important, a quick setting cement may be made, such as is used in dental work, consisting of oxid of zinc and glacial phosphoric acid, which hardens in a few minutes. But all things considered, except for the time required to set, I consider Portland cement, in exceedingly finely divided condition, to be preferable, both because it results in a harder and superior matrix and because more perfect records can be made therefrom. After the matrix is set, the ring or flange 5 is removed, and the matrix is separated from the master, which can be done without injuring the surface of the latter in any way, so that the master may be preserved and any desired number of matrices made therefrom. The matrix, which will be formed with a cutting flange 7 (corresponding to the groove 4) as will be understood, is now mounted in a suitable press plunger 8, movable over a bed 9 which may be heated if desired. On the bed and beneath the matrix, is placed a mass 10 of the desired hot plastic material—one employing shellac or so-called "button-stock," or other material—and the press plunger is forced downward with great pressure, so as to displace the material and squeeze it into a disk of the desired thickness, with the record impressed in its surface, as in the usual way. The cutting flange 7 will also partially sever the material, so that when the

impressed mass is removed the superfluous material may be trimmed off and the record finished in any suitable way.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is as follows:

1. The process of making a matrix from a disk-master formed in a wax-like material, which consists in coating the record surface with an excessively thin layer of a material not greatly water-repellent, in flowing thereover an emulsion of an excessively finely divided cement, in allowing the cement to set and harden, and in separating the resulting matrix from the master, substantially as and for the purposes set forth.

2. The process of making a matrix from a disk-master formed in a wax-like material, which consists in coating the record surface with an excessively thin layer of a material not greatly water-repellent, in flowing thereover a water emulsion of an excessively finely divided cement, in allowing the cement to set and harden, and in separating the resulting matrix from the master, substantially as and for the purposes set forth.

3. The process of making a matrix from a disk-master formed in a wax-like material, which consists in coating the record surface with an excessively thin layer of a material not greatly water-repellent, in flowing thereover a water emulsion of excessively finely divided Portland cement, in allowing the cement to set and harden, and in separating the resulting matrix from the master, substantially as set forth.

4. The process of duplicating talking machine records, which consists in forming a record groove in a wax-like material, then in coating the record surface with an excessively thin layer of a material not greatly water-repellent, then in flowing thereover an emulsion of an excessively finely divided cement, then in allowing the cement to set and harden, then in separating the resulting matrix from the master, and in finally forcibly impressing the matrix upon a mass of hot plastic material, substantially as set forth.

This specification signed and witnessed this 23rd day of February 1907.

THOS. A. EDISON.

Witnesses:

FRANK L. DYER,
ANNA R. KLEHM.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, ORANGE, NEW JERSEY.

PHONOGRAPH-REPRODUCER.

975,340.

Specification of Letters Patent.

Patented Nov. 8, 1910.

Application filed March 23, 1908. Serial No. 422,651.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Reproducers, of which the following is a description.

My invention relates to phonograph reproducers, more particularly of the type in which the stylus is carried by a lever pivotally secured to a floating weight, said lever being connected to a diaphragm carried by the sound box, and my invention has for its object the application of resilient means to said lever for the purpose of counterbalancing or opposing the vibrations of the said diaphragm, so as to eliminate false vibrations or overtones which pervert the quality of the reproduction, causing a harsh or metallic sound. Said resilient means is preferably in the form of a diaphragm similar to the sound box diaphragm, so as to be capable of vibrating in the same manner, that is, of responding in the same way to all of the waves constituting the sound record surface, and such diaphragm is preferably applied to and carried by the floating weight.

In order that my invention may be more fully understood, reference is hereby made to the accompanying drawings, of which—

Figure 1 is a bottom plan view of a phonograph reproducer constructed in accordance with my invention, and Fig. 2 is a section on line 2—2 of Fig. 1.

In the structure shown, 1 is the sound box body of the usual form, within which the diaphragm 2 which may be of hard copper is clamped between gaskets 3, by the clamping ring 4, all of these parts being of well-known construction. A floating weight 5 is pivoted at 6 to a block 7, carried on the lower end of a vertical pin 8 which passes through the body 1. The upper end of said pin is threaded, and an elongated nut 9 engages the same, said nut being held in position by an inverted cup 10 secured to the body 1, in any suitable manner. The nut 9 is provided with a head 11 for convenience in turning and the pin 8 may be adjusted up and down to any desired extent by rotation of the nut 9. The floating weight 5 is preferably of metal and along its free edge is secured a strip 12 for increasing the pressure of the stylus 13 on the record surface. The said stylus is held in a socket formed in the

lever 14, and the latter is pivoted at 15 to a pair of lugs 16 depending from the floating weight 5.

One end of the lever 14 is connected by the link 17, which passes through an opening in the floating weight, to a head 18 which is secured to the center of the diaphragm 2, and the other end of said lever is connected by a link 19 to a head 20, which is secured to the center of the diaphragm 21. By connecting opposite ends of the lever to the two diaphragms, they are caused to move simultaneously in opposite directions, whereby the pressure of the stylus upon the record is equalized and the vibrations of the diaphragm 2 are more perfectly counterbalanced.

The diaphragm 21 may be a corrugated plate of hard copper, such as the diaphragm 2, although my invention is not limited to the particular form of diaphragm 21. The diaphragm 21 is situated within a recess formed in the floating weight 5, and is clamped between gaskets 22 of rubber, paper or other suitable material, by means of screws 23, threaded in the weight 5, and countersunk within the cover plate 24, the said screws securing said cover plate, gaskets and diaphragm firmly to the floating weight 5. My experiments with a reproducer constructed in accordance with the drawing have shown me that the same will give an excellent reproduction of sounds from a phonograph record, but I do not limit myself to the exact structure shown, and include all such modifications and rearrangements of the parts thereof as will be obvious to one skilled in the art and as covered by the appended claims.

Having now described my invention, what I claim is:—

1. In a phonograph reproducer, the combination with the sound box, diaphragm, floating weight, stylus lever pivoted thereto, and stylus, of a diaphragm carried by said floating weight and connected to said stylus lever, substantially as set forth.

2. In a phonograph reproducer, the combination with the sound box, diaphragm, floating weight, stylus lever pivoted thereto and stylus, of a diaphragm carried by said floating weight and connected to said stylus lever on the opposite side of its fulcrum from the point at which the first diaphragm is connected, substantially as set forth.

3. In a phonograph reproducer, the com-

10 bination with the sound box and diaphragm,
of a floating weight provided with a recess,
a diaphragm within said recess, a stylus
lever pivotally secured to said weight, a
stylus carried thereby, and connections from
one end of the said lever to one diaphragm,
and from the other end of the lever to the
other diaphragm, substantially as set forth.

15 4. In a phonograph reproducer, the com-
bination with the sound box and diaphragm,
of a floating weight, a block to which said
weight is pivoted, and means for adjust-
ing the vertical position of said block com-

prising a threaded pin secured to said block
and engaging within a recess in the sound 15
box body, a nut mounted on said sound box
and engaging said threaded pin, and means
for preventing axial movement of said nut,
substantially as set forth.

This specification signed and witnessed 20
this 13th day of March 1908.

THOS. A. EDISON.

Witnesses:

FRANK L. DYER,
ANNA R. KLEHM.

P. WEBER.
 DIAPHRAGM FOR PHONOGRAPHS.
 APPLICATION FILED MAR. 22, 1907.

975,377.

Patented Nov. 8, 1910.

Fig. 1

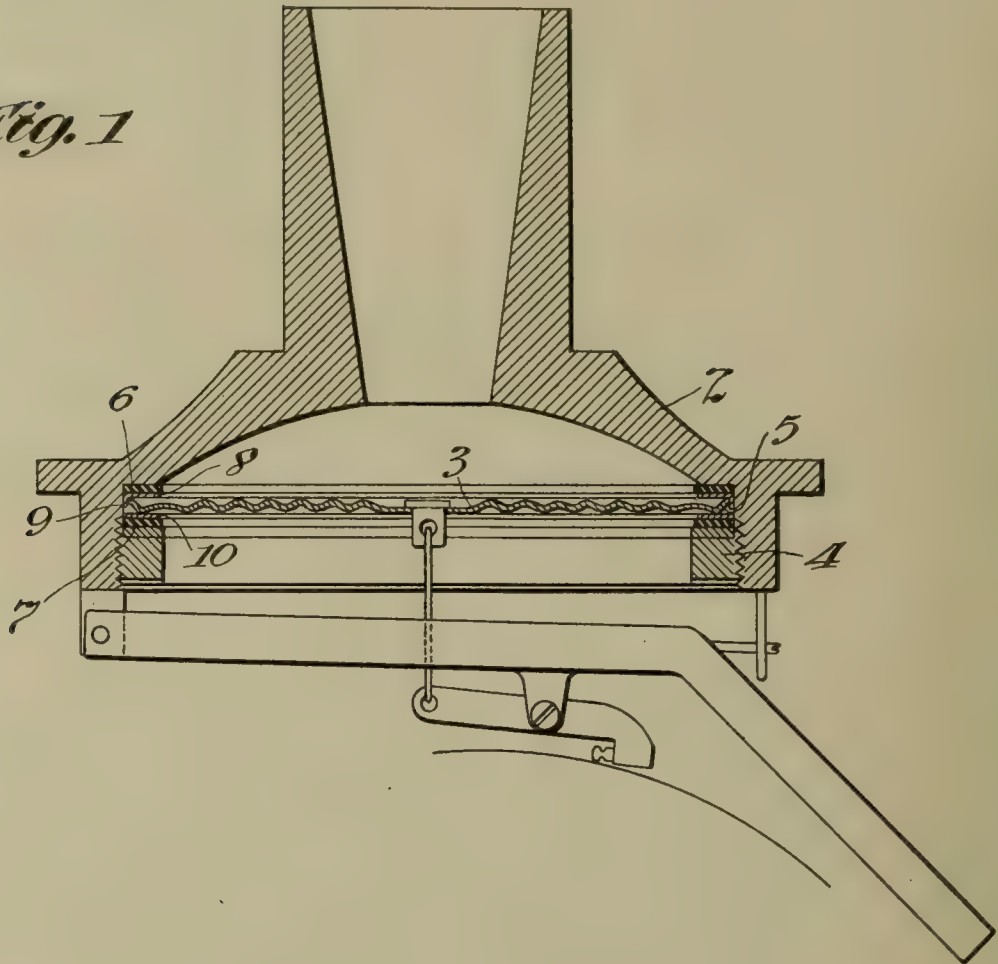
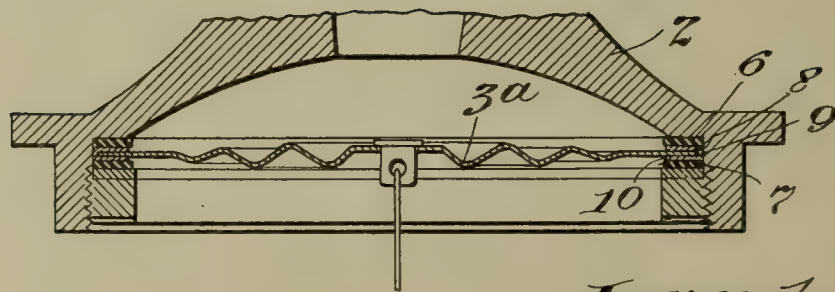


Fig. 2



Witnesses:
 Frank D. Lewis
 H. H. Dyke

Inventor:
 Peter Weber
 by Frank L. Dyke
 Att'y.

UNITED STATES PATENT OFFICE.

PETER WEBER, OF ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

DIAPHRAGM FOR PHONOGRAPHS.

975,377.

Specification of Letters Patent.

Patented Nov. 8, 1910.

Application filed March 22, 1907. Serial No. 363,814.

To all whom it may concern:

Be it known that I, PETER WEBER, a citizen of the United States, and a resident of Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Diaphragms for Phonographs, of which the following is a description.

In order to secure the correct reproduction of sounds by means of a vibrating diaphragm, it is desirable that means be provided for putting the diaphragm to be vibrated under an initial tension. Various means, extraneous to the diaphragm itself, such as springs, weights and the like, have been resorted to for this purpose.

I have discovered that very desirable results may be attained by so mounting the diaphragm in a sound box that it is kept in a state of tension due to the mode in which it is fastened therein, and without resorting to any extraneous tensioning devices.

An object of the present invention is to provide means for thus putting and maintaining the diaphragm under tension. One means which I find to be effectual is to so form the diaphragm that the clamping pressure will be applied to its opposite faces, at different distances from its center. A preferable mode of obtaining this result is to provide the margin of the diaphragm with a flange extending at an angle away from its general surface, so that when the edge of the diaphragm is clamped in place, clamping pressure will be applied on one face of the diaphragm at the outer margin of this flange and on its other face pressure will be applied at the base of the flange. Since the base of the flange is a short distance nearer the center of the diaphragm than its outer edge, this results in a bending stress upon the diaphragm which assumes a position where the bending stress is balanced by the elastic re-action of the diaphragm, which is thus maintained in a state of tension in which it is extremely responsive to any vibration which may be imparted to it. To do away with vibrations not common to the entire diaphragm, I may form my diaphragm with concentric corrugations extending throughout all of its surface except a small space at its center, and the margin thereof. This corrugated portion is quite stiff and vibrates substantially as a whole. The bending of the diaphragm due to its being

clamped on different concentric lines on its different faces, is thus confined to the outer portion and does not extend to the corrugated inner portion. Although I prefer to use a corrugated diaphragm, my invention may be applied to diaphragms of any form.

The material which I have found to be most desirable for use in a phonographic reproducer diaphragm, is hard, rolled sheet copper about .0025" in thickness. To properly secure the diaphragm in place rubber gaskets are commonly used. As, however, the sulfur in the rubber is apt to attack and corrode the copper, I interpose gaskets of material, which will not affect the copper, between the rubber gaskets and the copper diaphragm. I have found that paper is well suited to this use. I have also found that it is desirable to prevent the contact of the metal diaphragm with the metallic body of the sound box, as better results are obtained from diaphragms in which means are provided to prevent such contact. I therefore arrange the paper gaskets in such a way that they not only prevent contact between the copper diaphragm and the rubber gaskets, but also insulate the copper diaphragm from the metal of the sound box body. A preferable way in which to attain this end is to make one of the paper gaskets of the ordinary ring form while the other is made with a marginal flange or cupped portion, this flange serving to keep the edge of the diaphragm from contact with the metal of the sound box body, while the flat portion is interposed between the diaphragm and the rubber gasket.

In order that my invention may be better understood, attention is directed to the accompanying drawings in which—

Figure 1 is a view in central vertical section of a phonograph reproducer embodying my invention, and Fig. 2 is a similar view of a modified construction.

In both of the above views corresponding parts are represented by the same numerals of reference.

In the sound box body 2, the diaphragm 3 is clamped by means of a screw threaded ring 4. This diaphragm, throughout its surface, except at the margin and a small portion near its center, is formed with concentric corrugations by which means it is made quite stiff and at the same time as light as possible. A diaphragm formed in this

manner will not buckle under any ordinary strain. On the outer margin of the diaphragm 3 is formed a flange 5 extending at an angle to its general surface. Immediately inside of this flange a shallow groove is formed upon the opposite side of the diaphragm, in order that when the diaphragm is secured in place, the clamping pressure will be exerted in very narrow regions; on the upper side of the diaphragm, as shown, the pressure being only on the outer edge of the flange, and on the lower surface of the diaphragm the pressure being exerted only within a very narrow region at the base of the said flange. It is evident that with this construction, when the ring 4 is secured in its place, the diaphragm will be placed under tension due to the fact that the clamping pressure is exerted in regions not vertically opposite.

Rubber gaskets 6 and 7 are interposed between the seat in the sound box body 2 and the diaphragm, and between the ring 4 and the diaphragm. Immediately upon each face of the diaphragm 3 and between it and the rubber gaskets, are placed washers 8 and 10 of insulating material, preferably paper. The lower washer 10 as shown, is of the ordinary ring form, while the upper paper washer 8 is provided with a marginal flange 9, which is interposed between the edge of the diaphragm and the metal of the sound box body.

In Fig. 2 I have shown a diaphragm 3^a which is provided with corrugations increasing in depth toward the center, and having a flat margin. This margin has immediately beneath it an insulating washer 10 and immediately above it an insulating washer 8 having a marginal flange 9. These washers serve to prevent contact between the diaphragm and either the rubber gaskets or the metal of the sound box body. In this case, the margin of the diaphragm being flat, the insulating paper washers are in contact with the flat surface of the diaphragm throughout their whole surface.

While it is evident that I may place the paper washer having the marginal flange on either side of the diaphragm, I have shown it above the diaphragm for the reason that the parts may be more readily assembled by first introducing the flanged washer into the sound box body and thereafter positioning the diaphragm upon it, than would be the case if the diaphragm were first introduced upon the plain ring form washer and the flanged washer introduced thereafter.

Having now described my invention, what I claim as new is—

1. In a phonograph, a two part clamp, the clamping surfaces thereof being co-extensive and opposed to one another, and a diaphragm held in said clamp the said diaphragm being of such a conformation in

the neighborhood of its edges that said clamp operates to simultaneously place the diaphragm under tension and hold it in place, substantially as set forth.

2. In a phonograph, a sound box body provided with a clamping surface, clamping means provided with a cooperative clamping surface opposite the clamping surface of the sound box body, a diaphragm provided with a marginal flange interposed between the said clamping surfaces, the clamping pressure being applied to the base of the marginal flange and to the outer edge of the diaphragm respectively, substantially as set forth.

3. In a phonograph, the combination of a sound box body having a clamping surface, a diaphragm having a marginal flange and a shallow groove immediately inside the flange on the opposite side of the diaphragm, and means applied to the base of the said flange and opposite the clamping surface of the body for clamping the edge of the flanged portion of the diaphragm against the sound box body, substantially as set forth.

4. In a phonograph, the combination of a sound box body having a clamping surface, a corrugated diaphragm having a marginal flange and a shallow groove immediately inside the flange on the opposite side of the diaphragm, and means applied to the base of the said flange and opposite the clamping surface of the body for clamping the edge of the flanged portion of the diaphragm against the sound box body, substantially as set forth.

5. In a phonograph, the combination of a sound box body having a clamping surface, a diaphragm having a marginal flange and a shallow groove immediately inside the flange on the opposite side of the diaphragm, and means applied to the base of the said flange and opposite the clamping surface of the body for clamping the edge of the flanged portion of the diaphragm against the sound box body, and soft gaskets interposed between the diaphragm and the sound box body and between the diaphragm and the clamping means respectively, substantially as set forth.

6. In a phonograph, a sound box body provided with a clamping surface, a diaphragm provided with an angular marginal flange and with a groove immediately inside the flange on the opposite side of the diaphragm, forming thereby a sharp base for the flange, and a clamping means provided with a surface between which and said first named clamping surface said diaphragm is clamped at its marginal flange, the clamping pressure being applied by said surfaces to the sharp base and to the outer edge of said flange respectively, substantially as set forth.

7. In a phonograph, the combination of a
sound box body, a copper diaphragm, means
for clamping the diaphragm in the body,
rubber gaskets interposed between the dia-
5 phragm and the body and between the dia-
phragm and the clamping means respec-
tively, and gaskets of insulating material
interposed between the rubber gaskets and
the diaphragm, one of the same being of ring
10 form and one having a marginal flange in-
terposed between the edge of the diaphragm
and the sound box body, substantially as set
forth.

8. In a phonograph, the combination of a
15 sound box body, a corrugated copper dia-
phragm, means for clamping the diaphragm
in the body, rubber gaskets interposed be-

tween the body and the diaphragm and be-
tween the clamping means and the dia-
phragm respectively, a paper gasket be- 20
tween one of the rubber gaskets and the dia-
phragm and a second paper gasket having
a flanged margin, interposed between the
second rubber gasket and the diaphragm
and having its flanged portion interposed 25
between the edge of the diaphragm and the
sound box body, substantially as set forth.

This specification signed and witnessed
this 28th day of February 1907.

PETER WEBER.

Witnesses:

FRANK L. DYER,
FRANK D. LEWIS.

W. W. YOUNG.
ACOUSTIC DIAPHRAGM.
APPLICATION FILED MAR. 28, 1910.

975,596.

Patented Nov. 15, 1910.

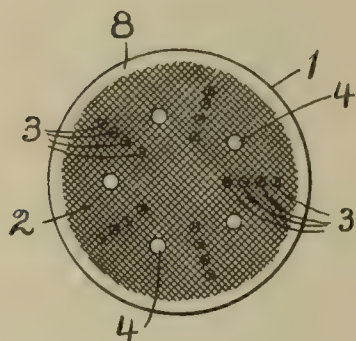


FIG. 1-

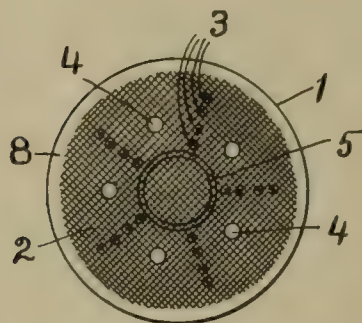


FIG. 2-

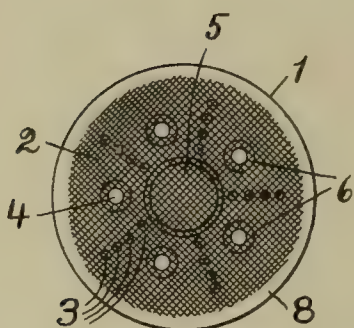


FIG. 3-

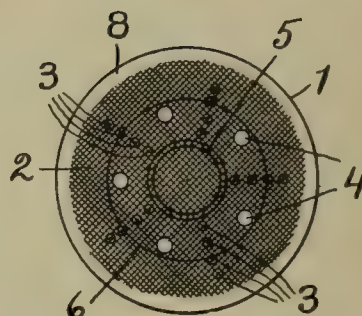


FIG. 4-



FIG. 5-

WITNESSES:

A. C. Fairbanks.
J. M. Davenport.

INVENTOR.

William W. Young,
BY
Webster & Co.,
ATTORNEYS.

UNITED STATES PATENT OFFICE.

WILLIAM W. YOUNG, OF SPRINGFIELD, MASSACHUSETTS.

ACOUSTIC DIAPHRAGM.

975,596.

Specification of Letters Patent.

Patented Nov. 15, 1910.

Application filed March 28, 1910. Serial No. 552,017.

To all whom it may concern:

Be it known that I, WILLIAM W. YOUNG, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented a new and useful Acoustic Diaphragm, of which the following is a specification.

My invention relates to improvements in acoustic diaphragms, and more particularly to acoustic diaphragms for use in the sound-boxes of talking-machines, although by no means restricted to such use, and consists essentially of a perforated disk of suitable material which has irregular or broken surfaces and also has burs formed thereon, a thin covering or coverings of suitable material on such disk for the perforations therein, and a suitable coating of material or materials capable of being applied in solution and then hardening upon said disk and in such perforations and said covering or coverings, the latter being permeable by such solution, all as hereinafter set forth.

The above-mentioned coating should be of a nature which insures the required permanent unity between it and the parts to which it is applied while in solution, and which adds materially to the excellency, efficiency, and value of the diaphragm. By the term "solution," as herein employed, is meant any compound, emulsion, or any character of mixture of suitable composition to produce the hard, permanent, and exceedingly advantageous or beneficial coating to which special attention has been called.

The object of my invention is to produce an acoustic diaphragm, of the above-indicated class, which possesses practically all of the desirable as well as the essential characteristics and qualities of a device of this kind, among which characteristics or qualities may be mentioned durability and stability, resiliency and resonance, capability of giving out clear, loud and distinct tones of great volume and depth, and of evenly distributing the sound waves, and immunity from blasts and scratching sounds and other alien and discordant noises.

Other objects will appear in the course of the following description.

I attain the objects and secure the advantages of my invention by the means illustrated in the accompanying drawings, in which—

Figure 1 is a side view of one form of

disk that may be used in my invention; Fig. 2, a similar view of a similar disk for a similar purpose, but slightly modified; Fig. 3, a side view of a finished diaphragm; Fig. 4, a side view of a slightly modified form of diaphragm, and, Fig. 5, a greatly enlarged and exaggerated cross-section through the center of a diaphragm which embodies the aforesaid invention in a practical form, as do in part or in whole the other views.

Some of the covering and some of the coating are omitted from the last view, but it will be understood that in reality the covering extends to the right of the center, over the burs, as far as it does to the left of the center, and the coating is over the entire device.

Similar figures refer to similar parts throughout the several views.

Diaphragms such as mine are invariably round, hence a member 1 in the shape of a disk is employed by me as the base or major element of my invention. This disk is thin, has its surfaces broken up by pebbling or pitting, as represented at 2, is provided with a number of burs 3 which are struck out of said disk, and is perforated so as to form a number of clean-cut holes 4 therein or there-through. The center of the disk 1 may be left undisturbed, save for the pits 2 and the corresponding convexities or protuberances, as shown in Fig. 1, or said center may be dished on one side and correspondingly bulged on the other side, as shown at 5 in the other views.

The holes 4 are transformed into what may be termed lesser diaphragms by means of one or more very thin coverings 6 and a coating 7. In Fig. 3 there is one of these coverings 6 for each hole 4, while in Fig. 4 only one such covering is employed, each covering in the first instance being concentric with its hole, and the single covering in the second instance being concentric with the disk 1. When the single covering is used, it may be larger than the one shown in Fig. 4, as much larger as may be desired up to the full superficial area of the disk 1. Although the shape of the coverings is not of vital importance, for the sake of appearance I prefer to make them round.

The coating 7 is on both sides of the disk 1 and the covering or coverings 6, and is the medium by means of which the latter are fixed to the former.

The disk 1 may be made of a variety of

different kinds of metallic and non-metallic materials, but any material to be adaptable for the purpose should be thin, of course, and must be capable of receiving and retaining the coating 7 and possess the necessary qualities of then producing the required effect. Thin sheet-aluminum and pure linen-fiber paper or cardboard are among the best materials and give some of the best results.

The pits 2 and the convexities or protuberances produced thereby are generally very numerous, quite small, and close together, although some variation in these particulars is permissible. Their arrangement may be regular or irregular, as desired. An unbroken ring 8 may be left on each side of the disk 1, outside of the pits and protuberances. These plane-surface rings 8 afford smooth, sound-box connecting bearings for the diaphragm.

The burs 3 are formed by punching them out of the disk 1 in such a way as to leave smooth, hollow, conical protuberances, through the small ends of which will be usually minute openings. These burs are preferably arranged radially around the dished center, or a corresponding area, of the disk 1, four (more or less) to a radius, with a hole 4 between adjacent radii, substantially as shown, but this order or arrangement of burs and holes is subject to some modification, and the number of holes as well as the number of burs may be changed.

The holes 4 will, as a rule, be round, although this is not imperative, and there may be considerable variation in their size.

I use for the covering or coverings 6 very thin fabric, such as tissue-paper.

The material or combination of materials used for the coating 7, and which is applied in any suitable manner to both sides of the disk 1 with its covering or coverings 6, must be of such a nature that it will adhere firmly to and intimately and permanently unite with the parts, and also fix such covering or coverings securely to said disk; furthermore, the nature of the coating must be such that it will so unite with the other elements and harden during the process of manufacturing the diaphragm as to produce a device having the required stability, permanence and excellence. The coating not only covers the disk and impregnates and permeates the covering or coverings, but fills the bur openings and also fills more or less completely the holes 4. A good coating solution for my purpose in this case, which is readily applied and as readily hardens when dry, consists of silicate of soda or silicate of potash, oxid of zinc, and an earth cement, mixed together with the proportions of about one part each of the oxid of zinc and the cement to about twenty parts of the silicate of soda or silicate of potash. These proportions may vary to

a considerable extent without seriously affecting the efficiency of the resulting coating.

As I am aware that other coating substances or materials will give the desired results, I do not intend to restrict myself to any particular coating substance or material or combination of the same suitable for the purpose.

Each of the elements or features herein described and which together make up this diaphragm, with the possible exception in some cases of the dished center, is indispensable to the attainment of the desired end, as I have found by long and careful experiment, the pits, burs, lesser diaphragms, and coating each contributing something essential to the perfection required of an acoustic diaphragm designed for talking-machine and analogous purposes. And in many if not most instances, it is not well to dispense with the dished center.

In practice, the pits and their protuberances are usually finer than they appear in the drawings.

In addition to the variations or modifications already noted others may be made without departing from the nature of my invention.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A disk, for a diaphragm of the class described, consisting of a pitted member having burs thereon and holes therethrough independent of the bur openings.

2. A disk, for a diaphragm of the class described, consisting of a member having its structure broken up throughout approximately its entire area, provided with burs, and having holes independent of the bur openings.

3. A disk, for a diaphragm of the class described, consisting of a member having protuberances over approximately the entire superficial area of its sides, provided with burs, and having holes independent of the bur openings.

4. A disk, for a diaphragm of the class described, consisting of a pitted member having burs thereon and holes therethrough independent of the bur openings, and provided with a dished center, such burs and holes being located between said dished center and the periphery of said member.

5. A diaphragm, of the class described, consisting of a pitted disk having burs thereon and holes therethrough independent of the bur openings, covering material on such disk for such holes, and a hard overlying coating on said disk and covering material and in the disk perforations and uniting said covering material with the disk.

6. A diaphragm, of the class described, consisting of a pitted disk having burs thereon and holes therethrough independent of

the bur openings, and provided with a
dished center, such burs and holes being lo-
cated between said dished center and the pe-
riphery of said disk, covering material on
5 such disk for such holes, and a hard over-
lying coating on said disk and covering
material and in the disk perforations and
uniting said covering material with the disk.

7. A diaphragm, of the class described,
10 consisting of a pitted disk having burs there-

on and holes therethrough independent of
the bur openings, covering material on such
disk for such holes, and a hard overlying
coating on said disk and covering material,
said covering material with the coating 15
thereon forming lesser diaphragms.

W. W. YOUNG.

Witnesses:

F. A. CUTTER,

A. C. FAIRBANKS.

W. W. YOUNG.
METHOD OF MAKING DIAPHRAGMS FOR TALKING MACHINES.
APPLICATION FILED DEC. 1, 1908.

975,668.

Patented Nov. 15, 1910.

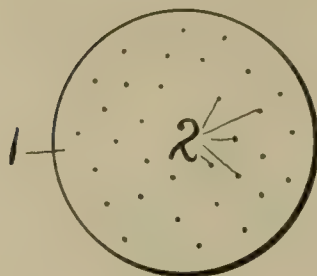


FIG. 1.



FIG. 2.



FIG. 3.



FIG. 4.

WITNESSES:

F. F. Withers.
A. C. Fairbanks.

INVENTOR.

William W. Young
BY
Webster & Co.,
ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM W. YOUNG, OF SPRINGFIELD, MASSACHUSETTS.

METHOD OF MAKING DIAPHRAGMS FOR TALKING-MACHINES.

975,668.

Specification of Letters Patent.

Patented Nov. 15, 1910.

Application filed December 1, 1908. Serial No. 465,474.

To all whom it may concern:

Be it known that I, WILLIAM W. YOUNG, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Methods of Making Diaphragms for Talking-Machines, of which the following is a specification.

10 My invention relates to improvements in methods of manufacturing reproducing diaphragms for talking-machines, and my method consists in a general way in thoroughly impregnating and permeating a suitable, more or less porous material with a compound, emulsion, or solution which possesses the necessary characteristics and qualifications, in imparting a proper surface treatment to such material, in hardening by
15 20 25 30 35 40 45 50 55

subjecting the treated material to heat and pressure, and in raising a portion of or producing an integral protuberance on the material, the resulting diaphragm being exceedingly compact, hard, and tough, although thin, and having smooth and even surfaces and possessing a uniform thickness throughout excepting in the center where the protuberance is located, all as hereinafter set forth.

The reproducing diaphragms commonly used in talking-machines are made of mica, or sheet-metal, the mica diaphragms predominating, and owing to this fact it is not possible to obtain the best results from such machines, since neither mica nor simple sheet-metal disks used as diaphragms are capable of producing such results, moreover, the mica disks or diaphragms are extremely fragile and also expensive because of the waste incident to procuring disks of the proper size, and the primary object of my invention is to produce a substitute for mica, sheet-metal, and other kinds of diaphragms, which substitute possesses the necessary or desirable features outlined in the preceding paragraph, and in addition is resilient and resonant, is impervious to moisture and unaffected by climatic changes, and is capable of giving out clear, loud, and distinct tones of great depth and volume, of evenly distributing the sound waves and quickly, completely, and perfectly recovering its stable equilibrium, and of lessening to a great extent, if not eradicating altogether, all alien and discordant noises such

as blasts and scratching sounds which are so prevalent with the ordinary diaphragm.

In the accompanying drawings, which form a part of this application and in which like characters of reference indicate like parts throughout the several views—Figure 1 is a side view of a cardboard disk perforated and ready for immersion; Fig. 2, a side view of a metallic plate which may be employed in compressing such disk; Fig. 3, a side view of a diaphragm complete, and, Fig. 4, a cross-section, on a large scale, of said diaphragm.

In carrying out my method and producing my diaphragm I make use of certain chemical substances or materials which have been found to give satisfaction, but I do not desire to be limited to these particular substances or materials; neither do I desire to be limited to the exact sequence or number of steps in putting said method into practice, since good results may be obtained even though some little departure be made in the order or number, or both, of such steps.

Although it is my practice to treat individual disks to produce the diaphragms, it is conceivable that strips or sheets of cardboard or other suitable material might be treated and the diaphragms subsequently cut out of such strips or sheets.

While it is true that almost any fibrous material or fabric, which is sufficiently porous to take up an adequate amount of a filling solution, such as leather, various kinds of paper, or cloth may be used, I find that a pure, hard-finished bristol-board which is quite thin answers better for this purpose than anything else so far tried, provided the same be perforated before it is subjected to the aforesaid solution. In the first view a bristol-board disk 1 is represented, and in this disk is a number of very fine holes 2. The holes 2 are quite numerous and extend through the disk 1 from side to side. One object of these perforations or holes 2 is to open numerous ways into the interior of the disk 1, so as to enable the solution to penetrate and permeate all parts of the disk structure and to become thoroughly and evenly distributed therein and therethrough, thus insuring after drying and pressing the disk that it will have practically no unfilled portions. Another object of the aforesaid perforations is to afford means for producing a diaphragm having a structure of dif-

ferent materials, or a structure that is broken up or divided into unlike parts as to texture.

As a filling for the texture of the disk 1, whether or not said disk be perforated, I prefer to employ one or more minerals mixed with and held in solution in water by an alkali, together with an inert or neutral mineral that will mix with water and form with the other solution when combined therewith a suitable compound, mixture, or emulsion. As the first basis for this emulsion I now employ silicate of soda or silicate of potash, and to one of these I add dry oxid of zinc. The resulting mixture or emulsion is particularly adapted for my purpose, since it readily unites with the disk 1 in a most thorough manner by entering into the texture of the same and imparts to such disk when finished and finally converted into a diaphragm just the properties that are required.

After perforating the disk 1, provided this be resorted to, as is generally the case, said disk is immersed in the filling emulsion or filler until thoroughly saturated, next the disk is partially dried either with or without artificial heat, preferably without, next a dry powder such as oxid of zinc is applied to both sides of the disk, then the latter is compressed between two steel plates, then it is subjected to heat, then it is coated on both sides with some of said filler and powder is applied as before, then it is partially dried again, as in the first instance, then compressed again, and finally the treated disk is once more subjected to heat until any moisture that might have remained has been driven out and the now practically finished diaphragm is hard. Although the diaphragm is substantially in a finished condition, the coating and the subsequent drying and heating with the intermediate compressing may be repeated one or more times as may be deemed necessary or desirable in order more perfectly to fit said diaphragm for use. During this process a portion of the disk 1 in the center has been left in a less dense and compact condition, and consequently has been raised slightly so that there is a protuberance 3 in the center of the finished diaphragm 4, on one or both sides.

In order to produce the protuberance 3 the plates between which the disk 1 is compressed might be made with male and female parts like ordinary dies, and then, of course, the raised portion of the disk would be of the same density as the other parts, but I prefer to use plates like the one shown at 5, Fig. 2. In this plate 5 it will be noticed there is a central opening 6, and it is into this opening, or a similar one in the plate on the other side of the disk 1, or in both of such openings, that the central portion of said disk expands during the com-

pressing operation to form the protuberance 3. Thus it will be seen that the protuberance 3 may be on either or both sides of the diaphragm 4, and that in any event the texture of such protuberance will be less compact or dense and consequently thicker than that of the surrounding parts, because it is not subjected to pressure like that of said surrounding parts, this difference being clearly apparent in Fig. 4. The qualities of the diaphragm are not affected by the position of the protuberance 3 so that it is immaterial whether said protuberance be on one side or the other of said diaphragm or whether it be upon both sides.

The protuberance 3 not only reinforces the diaphragm 4, by assisting in keeping the diaphragm from getting out of shape or warping and at the same time by increasing the strength, durability, and endurance, of the same, but enhances the sound reproducing qualities of the diaphragm in a most marked degree, and is especially efficacious in causing the sound waves to be evenly distributed and the diaphragm to make a quick and perfect recovery thereafter. This protuberance is not built up out of other materials or parts, but is an integral part of the diaphragm itself, therefore it cannot work loose and so produce a rattling sound or blast as it otherwise would be liable to do.

The effect of the compression between the steel plates, as will be very readily understood, is to force the filling into all parts of the disk 1, even into the central portion thereof, and to close the perforations 2 both with the filling and to some extent with the original texture. The surfaces of the disk are treated, as well as the interior, so that in the end there is produced a diaphragm which possesses certain characteristics that approach those of metal, such as hardness, resiliency, resonance and smoothness. The materials that I use for filling and coating the disks enter intimately into the cellular structure of said disks and thus form a mechanical union therewith, and it is probable that a chemical change also takes place. By following this method any number of diaphragms may be produced and all will have the desired qualifications.

An air drying merely for the first one, that is, the drying after the immersion of the disk in the filling bath, is generally sufficient, as it is then desired to only partially dry the saturated disk so it can be compressed, and the same is true of all dryings which immediately precede compressing. But the other dryings should be by subjection to heat, for the reasons previously given and for the further reason that heat tempers the filling and coating material to such an extent and in such a way as to enhance the resonant qualities of the diaphragm.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The method of making diaphragms, for talking-machines, consisting in introducing
5 as a filler into porous material a deposit from a silicate, an alkali and a neutral mineral in solution, and in hardening such filled material.

2. The method of making diaphragms, for
10 talking-machines, consisting in introducing as a filler into porous material a deposit from a silicate, an alkali and a neutral mineral in solution, and in compressing and drying such filled material.

15 3. The method of making diaphragms, for talking-machines, consisting in perforating a piece of fibrous material, in immersing such perforated material in a filling compound, and in compressing between hard
20 imporous surfaces and drying the filled material.

4. The method of making diaphragms, for

talking-machines, consisting in immersing porous material in a filling bath, then in partially drying the material thus treated, 25 then in powdering such material, then in compressing the same, then in subjecting it to heat, then in coating with the filler and powdering once more, then in partially drying again, then in compressing again, and 30 finally in subjecting to heat again.

5. The method of making diaphragms, for talking-machines, consisting in immersing porous material in a filling bath, in compressing such filled material between hard 35 plates having openings therein arranged and adapted to afford room for the expansion of such portion of the material as is adjacent to such openings, and in drying said material.

WILLIAM W. YOUNG.

Witnesses:

F. A. CUTTER,

A. C. FAIRBANKS.

976,502.

Patented Nov. 22, 1910.

2 SHEETS-SHEET 1.

Fig. III

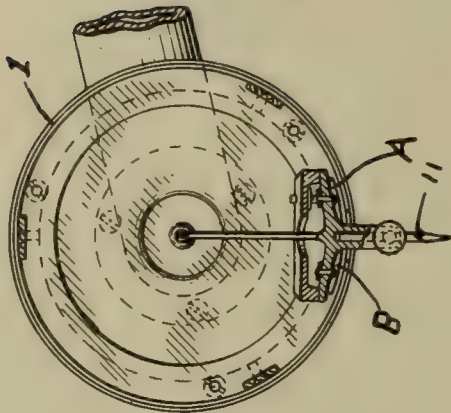


Fig. II

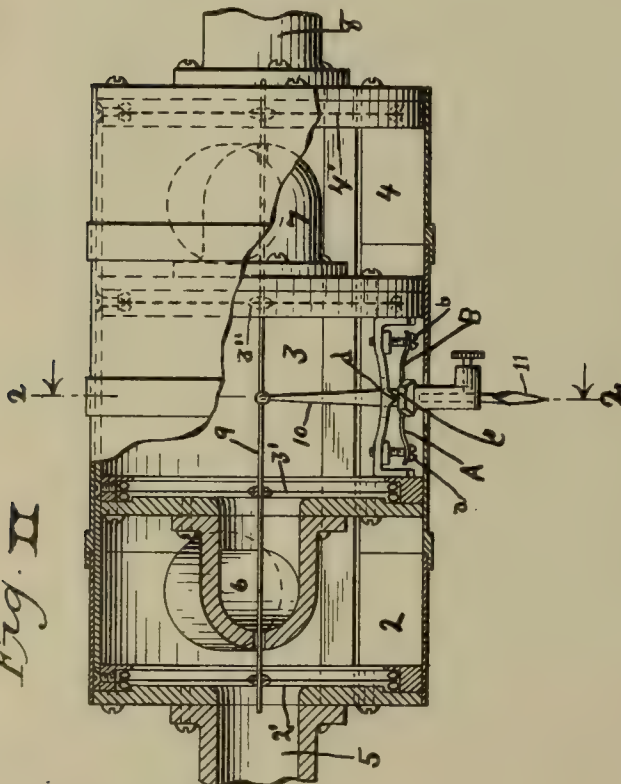
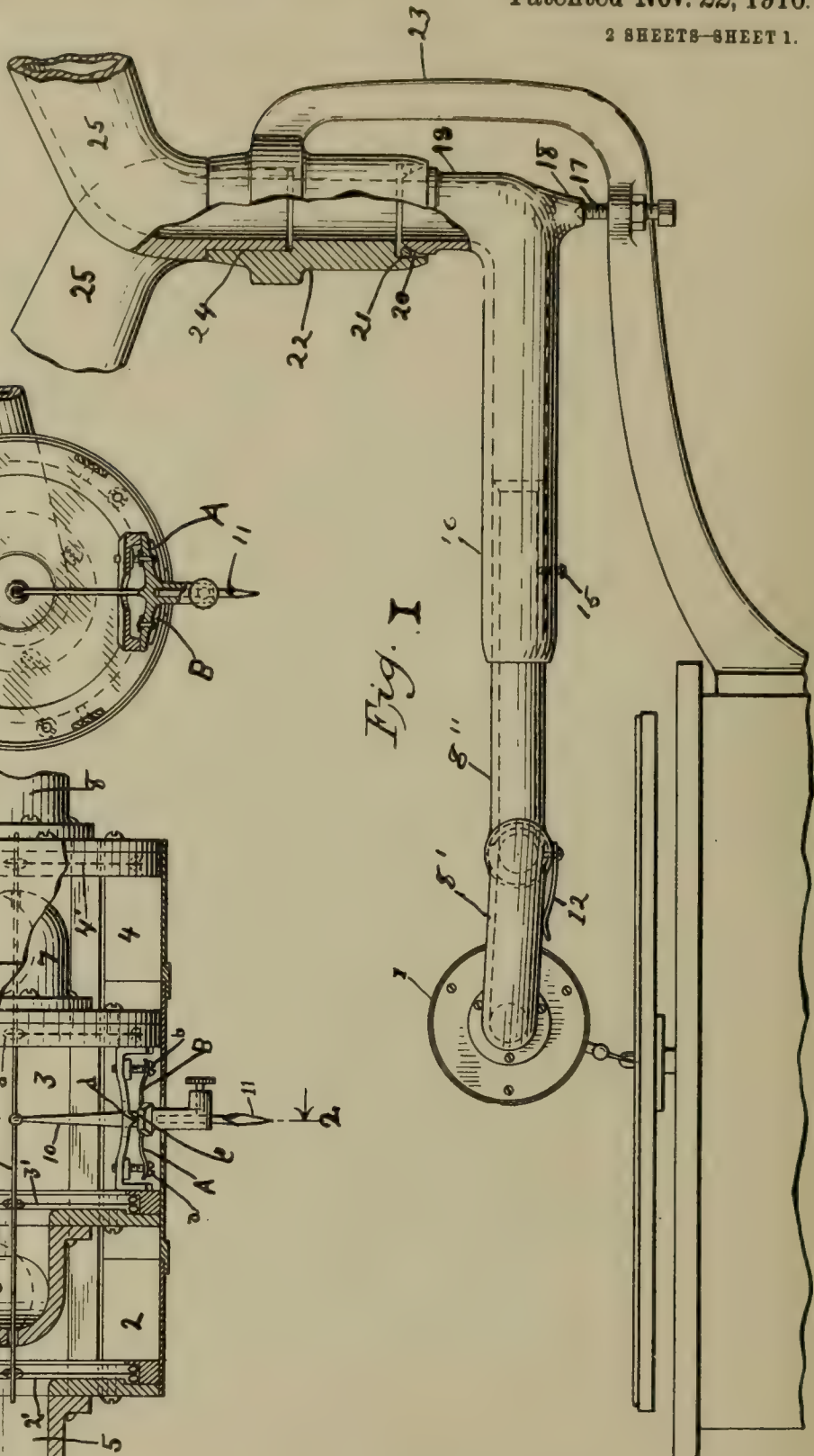


Fig. I



Witnesses:

A. L. Lord.
 John J. Donnelly

Inventor.

Anton F. Schönwetter.

By W. E. Donnelly
 His Attorney.

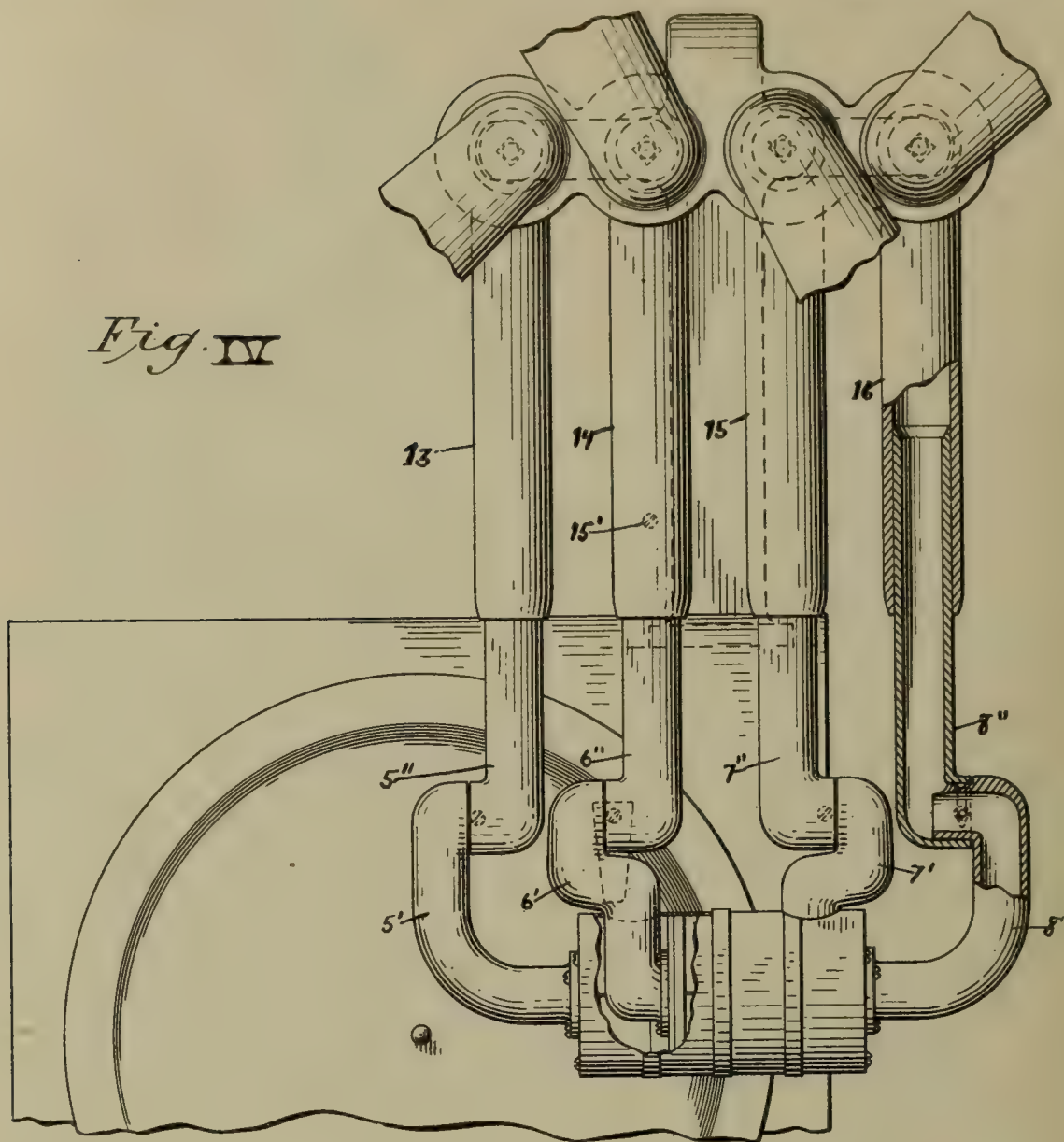
A. F. SCHÖNWETTER.
PHONOGRAPH SOUND BOX.
APPLICATION FILED JAN. 7, 1910.

976,502.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 2.

Fig. IV



Witnesses:
A. L. Lord.
John J. Donnelly.

Inventor.
Anton F. Schönwetter
By W. E. Donnelly
His Attorney.

UNITED STATES PATENT OFFICE.

ANTON F. SCHÖNWETTER, OF CLEVELAND, OHIO.

PHONOGRAPH SOUND-BOX.

976,502.

Specification of Letters Patent.

Patented Nov. 22, 1910.

Application filed January 7, 1910. Serial No. 536,794.

To all whom it may concern:

Be it known that I, ANTON F. SCHÖNWETTER, a citizen of Austria, and a subject of Kaiser Francis Joseph, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented some certain new and useful Improvements in Phonograph Sound-Boxes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

This invention relates to phonographs of the type having a plurality of diaphragms and horns.

The object of this invention is to effect a duplication of the sound vibrations created by a single stylus or needle operated through a record, by causing the vibrations so created to act on a plurality,—in the case shown, four,—diaphragms, and vibrating them simultaneously in their respective sound chambers, and providing each individual sound chamber with a separate sound conducting tube.

My invention consists in a plurality of diaphragms mounted and operated in separate sound chambers connected together so as to vibrate in unison, and a single stylus mechanism so connected that it will operate to vibrate all of the diaphragms, and in providing a separate chamber for each diaphragm, which constitutes its sound box, and providing also means such as tubes leading from said sound boxes respectively, to which may be attached horns if found desirable.

My invention further consists in the construction of phonograph sound boxes, the manner of connecting them together and the construction of intercommunicating tubes, all of which will be hereinafter fully set forth and claimed.

In the drawings, Figure I, is a view in side elevation illustrating the construction of the sound carrying tubes and their relation to their frame and mountings, also showing the multiple sound box and the manner of mounting the same, and the ends of the tubes. Fig. II, is a view partly in section, showing the internal construction of my sound box with the several diaphragms mounted therein, the manner of connecting said diaphragms to each other and the connection of the stylus with said diaphragms. Fig. III, is a cross sectional view taken through lines 2, 2 Fig. II. Fig. IV, is a

plan view looking at the apparatus from the upper side, and illustrating the assemblage of the different tubes and the manner of operation of the device as a whole for the purpose of causing the stylus to follow the record without impairing in any way the vibrations.

1, represents the multiple sound box which in the case illustrated, is illustrated as of tubular construction. This multiple sound box is divided into separate chambers 2, 3 and 4, the chamber 2, having mounted therein a diaphragm 2', at one end and in close proximity to the sound tube 5. The chamber 3, at one end is also provided with a diaphragm 3', mounted in close proximity to the sound tube 6. At the opposite end of the chamber 3, opposed to the diaphragm 3' is mounted another diaphragm 3'', which is shown in dotted lines in Fig. II, of the drawings. This diaphragm 3'' is mounted in close proximity to the sound tube 7. The chamber 4 is also provided with a diaphragm 4' illustrated in dotted lines in Fig. II, which is mounted in close proximity to sound tube 8. It will thus be seen that each diaphragm 2', 3', 3'' and 4', are provided with respective sound conveying tubes 5, 6, 7 and 8, the mouths of which are in close proximity to said diaphragm. The diaphragms 2', 3', 3'' and 4' are connected together by means of a flexible connection 9, which in the case illustrated is preferably a wire, the same being cemented at the central portion of each diaphragm. Thus as said connection 9, is vibrated it causes the diaphragms to vibrate in unison.

Centrally located relative to the multiple sound box and connected to the flexible connection 9, is the stylus holder 10, which is mounted on two spring arms A. B. which forms part of said stylus holder 10, and are connected therewith, the same being supported by means of the screws *a. b.* for adjusting purposes. The stylus holder 10, is provided with a bearing surface *c*, which rests against the knife edge *d*. These bearings being adjusted and brought together through the medium of the screws *a. b.* Thus it will be seen that the mounting of the stylus holder is such that while it has a free vibratory action, it follows the characters on the record in consequence of which movements are imparted to it through the stylus, and all rattling, scratching or play movement are obviated. The metallic parts

that move in relation to each other are the knife edge *d* on the surface *c*. This obviates as it will be understood, all foreign sounds or scratching which would attend as a discord, and also provides means for imparting to the diaphragms the most minute variations or pitch of tones.

I now come to the manner of mounting the multiple sound box, which is as follows:
 10 The several branches 5', 6', 7', and 8', of the tubes 5, 6, 7, and 8, are swiveled to the tubes 5'', 6'', 7'', and 8'', in such a manner that the sound box will raise and lower with the variations of the record surface, always tend-
 15 ing by the partial weight of the sound box to keep the stylus 11, in contact within the grooves of the record. However, in order that the sound box may partially be supported should it be too heavy so as to wear
 20 upon the record through the stylus 11, I have provided a spring 12, which may be made adjustable for supporting the sound box through one of its branches, in this case the branch tube 6'. This spring supports a
 25 portion of the weight of the sound box, but at the same time allows of sufficient pressure for the proper reproduction from the record.

The sections 5'', 6'', 7'', 8'', are telescoped into tubes 13, 14, 15, and 16, in such
 30 a manner that the sections 5'', 7'', and 8'', slide freely within the tubes 13, 14, 15 and 16. The section 6'' being held in predetermined adjustment in relation to its tube 14, by means of a screw 15, as the stylus with
 35 its sound box travels along the face of the record, toward the center of the same, the section 5'', moves inward within tube 13, and the sections 7'', and 8'', slide outwardly. The fitting of these joints is such that no
 40 appreciable sound or scratching results from the movement in relation to each other. In the movement of the stylus with its sound box toward the center of the record or from one side to the other of the record, it is of
 45 course essential that the arms 13, 14, 15 and 16, have an oscillating movement or swinging movement in a horizontal plane, and for this purpose I have mounted the several sections 13, 14, 15 and 16 as illustrated in Fig.
 50 I, of the drawings, by providing the same with an adjustable center screw 17, resting

in the step 18, and also by forming the upper end 19, of the several sections with a ball set 20, which engage antifriction balls 21, in a race-way formed in the under side of the
 55 vertical journal 22, which in turn forms part of or is secured to arm 23. This allows of a free noiseless movement of the several sections 13, 14, 15, and 16 in a horizontal direction, and provides a convenient means
 60 for assembling and taking apart the several portions of the machine. At the upper end of the journals 22 I provide sockets such as 24, for the reception of the receiving ends of the several horns 25, 25, allowing these horns
 65 to be swiveled or turned in any desired direction in relation to each other, to the machine, and to the apartment in which said machine is operated, and hence the sound
 70 issuing from the several horns due to the vibration of their independent diaphragms, is so distributed as to modify the pitch and harshness which is usually evidenced in phonographs, and to obtain a volume with-
 75 out unnecessary loudness. This is attained by providing separate diaphragms in close relation to the sound conveying tubes of the independent horns connecting the said diaphragms together so that they will vibrate
 80 in unison, and providing separate sound chambers for each individual sound conveying tube and horn.

What I claim is:

A reproducer for sound waves comprising a sound box having end and intermediate chambers separated by partitions, tubes
 85 extending into the end chambers and connected to each partition and other tubes connected to the ends of the box, diaphragms located in the chambers, opposite the ends of
 90 the tubes, a flexible connection between said diaphragms and extending through openings in the partitions, and a stylus operatively connected to said connections, in the intermediate chamber.
 95

Signed at Cleveland in the county of Cuyahoga and State of Ohio, this 28th day of December 1909.

ANTON F. SCHÖNWETTER.

Witnesses:

J. J. DONNELLY,
 FRANK C. GREGG.

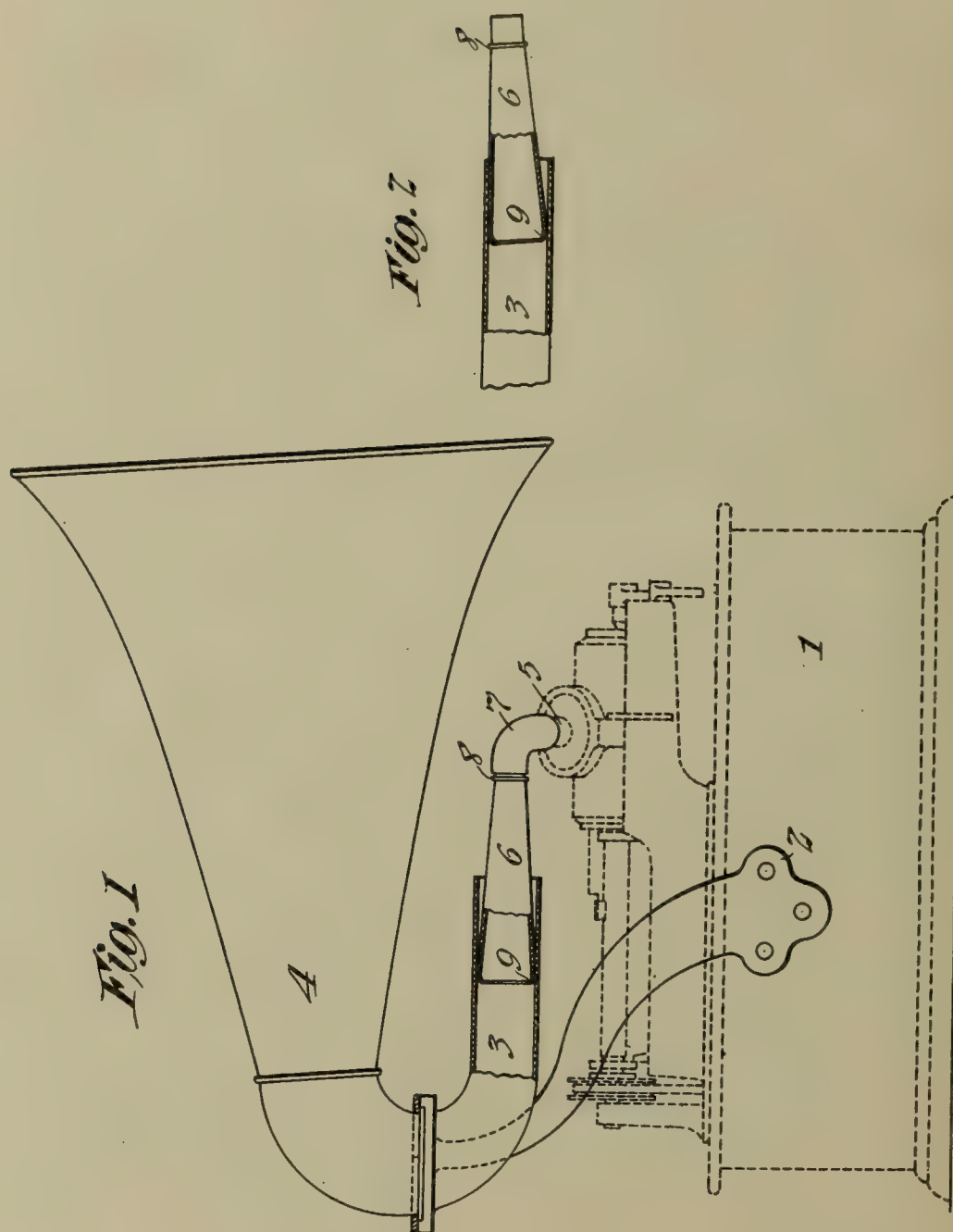
W. H. Miller

W. H. MILLER.
PHONOGRAPH.

APPLICATION FILED MAY 1, 1908

976,821.

Patented Nov. 22, 1910.



Witnesses:
Frank D. Lewis
H. H. Dyke

Inventor:
Walter H. Miller
by Frank L. Dyke
Atty.

UNITED STATES PATENT OFFICE.

WALTER H. MILLER, OF ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH.

976,821.

Specification of Letters Patent.

Patented Nov. 22, 1910.

Application filed May 1, 1908. Serial No. 430,259.

To all whom it may concern:

Be it known that I, WALTER H. MILLER, a citizen of the United States, and a resident of Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

My invention relates to phonographs and particularly to phonograph horns and means for supporting the same, and to an improved arrangement whereby a permanently positioned section of the horn may be connected with the movable reproducer. It has been common heretofore to project the horn forwardly from the machine and to support it movably upon a horn crane or equivalent device. In order to avoid the objections incident to this form of arrangement of horn and to permit the use of a horn sufficiently large to obtain the best reproduction, it has been proposed to mount a section of the horn rigidly or rotatively upon some portion of the machine or a bracket connected therewith and thus permit the horn to extend from the rear of the machine over the machine and in front thereof; but in all such devices of which I am aware it has been found necessary, in making connections between the horn so rigidly or rotatively mounted and the neck of the phonograph reproducer which in the phonograph and allied talking machines travels in a straight line longitudinally of the machine, to provide a telescopic connection or its equivalent so that the communication between the reproducer neck and the permanently positioned horn section may be maintained notwithstanding the movement of the reproducer. These telescopic or equivalent connections, so far as I am aware, have been so arranged that bending and twisting stresses have been imposed upon the telescoping parts. In a device constructed in accordance with my improvements all such bending and twisting and similar stresses are eliminated and the telescopic connection is enabled to perform its function without stresses or strain of any kind. This result is accomplished by rigidly and permanently connecting a tube, preferably cylindrical in form and having the elements of its walls parallel to one another, in such a position that its longitudinal axis is parallel to the path traversed by the phonograph reproducer in its movement transversely to the

record surface. One end of this tube communicates with the permanently positioned portion of the horn or megaphone while a tapered telescoping section is connected with the neck of the phonograph reproducer and travels within the cylindrical tube as the reproducer moves to and fro. Since the travel of the reproducer is in a line parallel to the principal axis of the fixed tube, the member connecting the tube to the reproducer neck simply slides back and forth in the said fixed tube in straight lines without creating any stress or strain of any nature. It is desirable that the hollow member which slides in the fixed tube be so arranged that it can be disconnected from the neck of the reproducer and for this reason I construct the said sliding hollow member in such a fashion that it is capable of universal motion with respect to the tube wherein it slides. Any form of construction which will secure this result may be used within the scope of my invention but I have shown and prefer to make the sliding member tapering in form, the smaller end being that communicating with the reproducer neck and having the edges around the opening in its larger end turned inward somewhat so as to form in this neighborhood what is substantially a ball joint.

In order that my invention may be more fully understood, reference is hereby made to the accompanying drawings which form a part of this specification and wherein the same numerals of reference are uniformly used to designate the same parts.

In the drawings Figure 1 is a front elevational view, showing my improved horn and connections applied to a phonograph which latter is shown in dotted lines; and Fig. 2 is a detail sectional view, showing the slidable member for connecting the fixed tube and the reproducer neck in its raised position in which it can be disconnected from the neck of the reproducer.

In the drawings the numeral 1 indicates the phonograph to which my improvement is applied. I have found it convenient to connect my rigid tube, which is arranged parallel to the path traversed by the phonograph reproducer, to the phonograph by means of a bracket secured to the rear of the phonograph and extending upwardly and forwardly and toward the end of the instrument in such a manner that the rigid tube

may be connected by an upward bend to the lower face of the said bracket substantially on the central longitudinal line of the instrument and at the end thereof opposite the
 5 end-gate or place where the record is placed upon the mandrel. The permanently positioned portion of the horn, which comprises the bell shaped mouth piece, is connected to the opposite or upper face of the bracket
 10 and is preferably so mounted that it may be made to rotate in a horizontal plane as is common.

The rigid tube which is parallel to the path of the reproducer is indicated by the
 15 reference numeral 3 and the permanently connected portion of the horn which comprises the bell shaped mouth piece as designated by the reference numeral 4. It is to be understood that, while I prefer to provide
 20 the common supporting means for the mouth piece 4 and the rigid tube 3 in the neighborhood of one end of the instrument and at a short distance thereabove, these devices may be supported from the phonograph cabinet
 25 by any convenient form of support, as well as that which I have described and shown.

The member for connecting the neck of the reproducer 5 to the cylindrical tube 3 is designated by the reference numeral 6. This
 30 hollow member is tapering in form and its smaller end is preferably removably connected to the reproducer neck 5 by means of an elbow 7. An outwardly projecting bead 8 is preferably formed upon the member 6 and
 35 serves to determine the position of the elbow 7 thereon. The larger end of the member 6, which fits fairly closely, although not tightly within the tube 3 is provided with an inwardly bent lip or flange 9 which makes
 40 substantially a ball joint so that the member 6 may be moved to one side or upwardly as shown in Fig. 2 without disturbing the communication between the member 6 and the tube 3.

The operation of the device will be apparent from the description already given. As the phonograph is operated the traveling carriage which bears the reproducer having the neck 5 moves transversely to the mandrel of the phonograph. In this movement
 50 the slidable member 6 is carried with the reproducer and telescopes within the tube 3 without any stress or strain other than the slight friction of one body moving in a right
 55 line longitudinally within the other. When a record has been played and it is desired to move the reproducer back to its original position the reproducer is raised in the usual fashion, so as to disengage the feed-nut
 60 from the feed-screw, and is moved toward the left as shown in Fig. 1 and the slidable

body 6 is pushed backward within the tube 3 as the reproducer is retracted. When the reproducer is again lowered so that the stylus will track the record the operation is
 65 repeated. It will be evident that with the device shown, a horn may be used which may be as large as is desired, since when the horn is turned so as to be directed endwise of the phonograph, as shown in Fig. 1 the
 70 entire length of the phonograph cabinet serves as a supporting base for the horn and it would be practically impossible to overturn this cabinet in a longitudinal direction by the use of a horn of any reasonable
 75 size. The horn, however, may be turned in any desired direction, as will be evident.

By the term "permanently positioned horn section" which I have made use of above and which is used in the claims, I
 80 mean the horn section which comprises the mouth piece of the horn and which is preferably mounted so as to rotate in a horizontal plane, but which has its smaller entrance end permanently located with respect
 85 to the phonograph.

Having now described my invention, I claim:

1. In a phonograph, the combination with a permanently positioned horn section, a
 90 movable reproducer, a fixed tube having its longitudinal axis parallel to the path of the movement of the reproducer and communicating with said permanently positioned
 95 horn section and a tapering tube attached to the neck of the reproducer and adapted to travel in a straight line within the said tapering tube and having a rounded inwardly flanged portion at its larger end where it slides within the said cylindrical
 100 tube forming thereby a substantially ball joint, substantially as set forth.

2. In a phonograph, the combination of a permanently positioned horn section, supported substantially centrally above one end
 105 of the phonograph cabinet, a reproducer, a fixed tube communicating with said horn section and extending longitudinally of the machine and substantially parallel with the path of movement of the reproducer and a
 110 tube having a rounded inwardly flanged portion at its inner end adapted to slide longitudinally and oscillate transversely of its axis in said fixed cylindrical tube and having means of connection with said repro-
 115 ducer, substantially as set forth.

This specification signed and witnessed this 30th day of April 1908.

WALTER H. MILLER.

Witnesses:

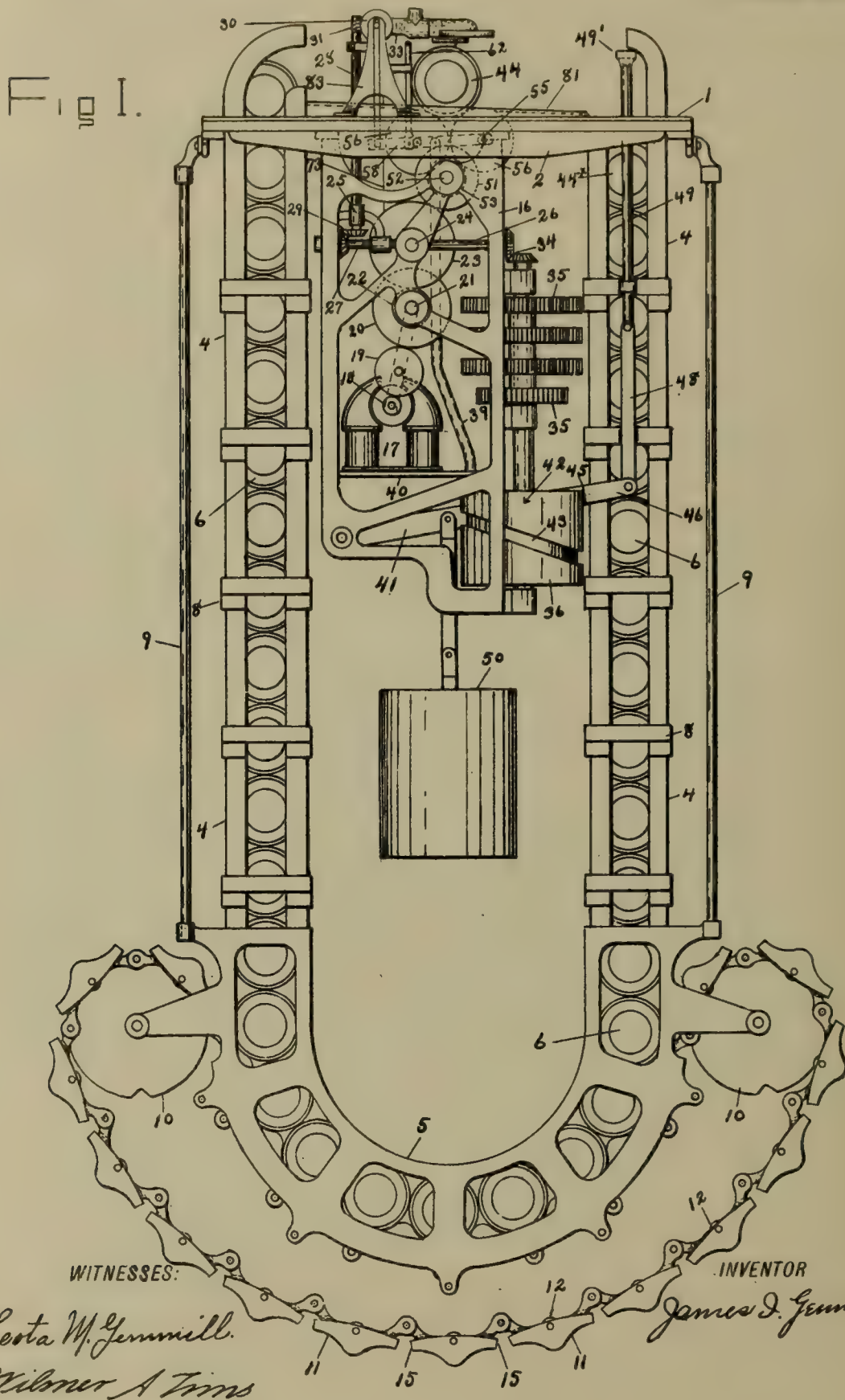
FRANK D. LEWIS,
 H. H. DYKE.

J. I. GEMMILL.
 AUTOMATIC PHONOGRAPH OF THE WAX CYLINDER TYPE.
 APPLICATION FILED JULY 11, 1908.

978,014.

Patented Dec. 6, 1910.

6 SHEETS—SHEET 1.



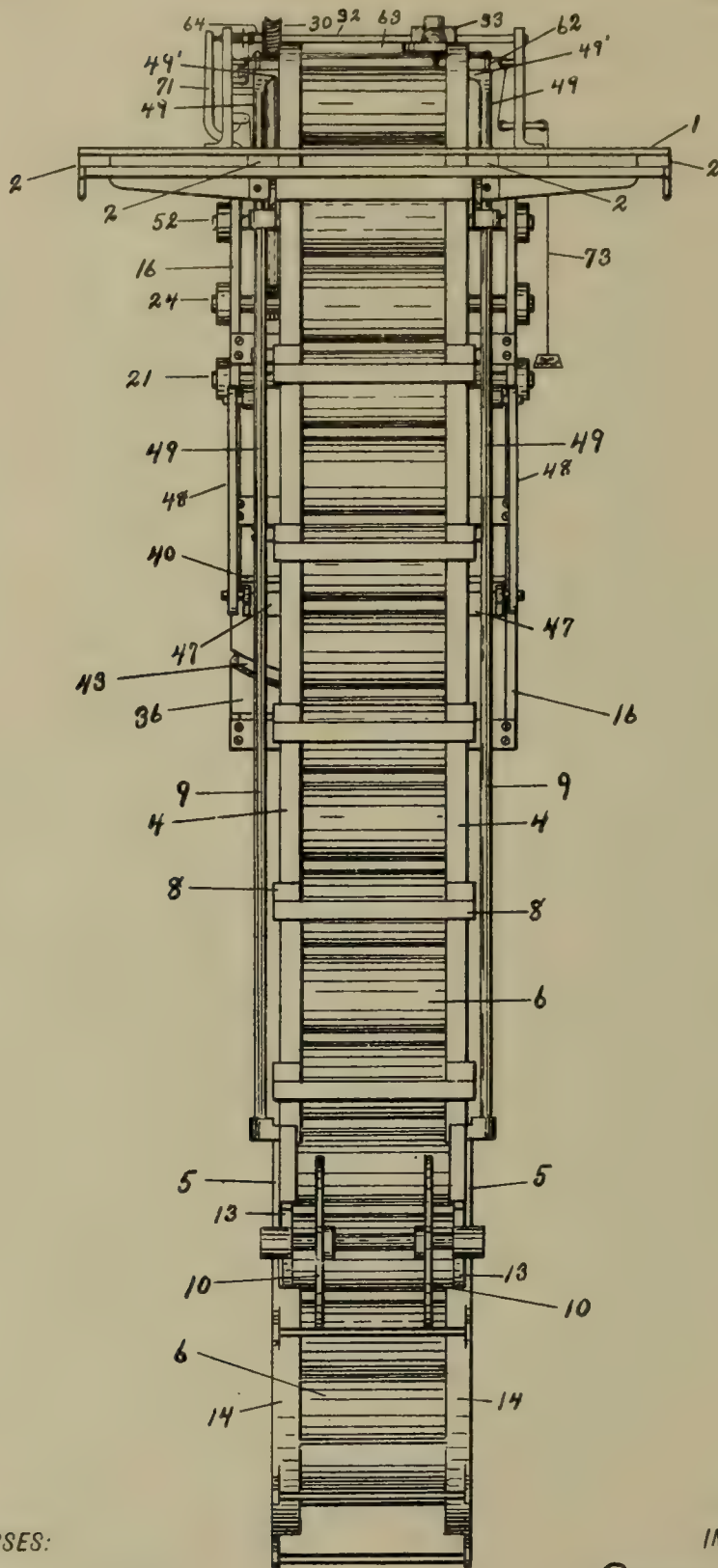
J. I. GEMMILL.
 AUTOMATIC PHONOGRAPH OF THE WAX CYLINDER TYPE.
 APPLICATION FILED JULY 11, 1908.

978,014.

Patented Dec. 6, 1910.

6 SHEETS—SHEET 2.

Fig II.



WITNESSES:

Lota M. Gemmill.

Wilmer A. Tims

INVENTOR

James I. Gemmill.

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 AUTOMATIC PHONOGRAPH OF THE WAX CYLINDER TYPE.
 APPLICATION FILED JULY 11, 1908.

978,014.

Patented Dec. 6, 1910.

6 SHEETS—SHEET 3.

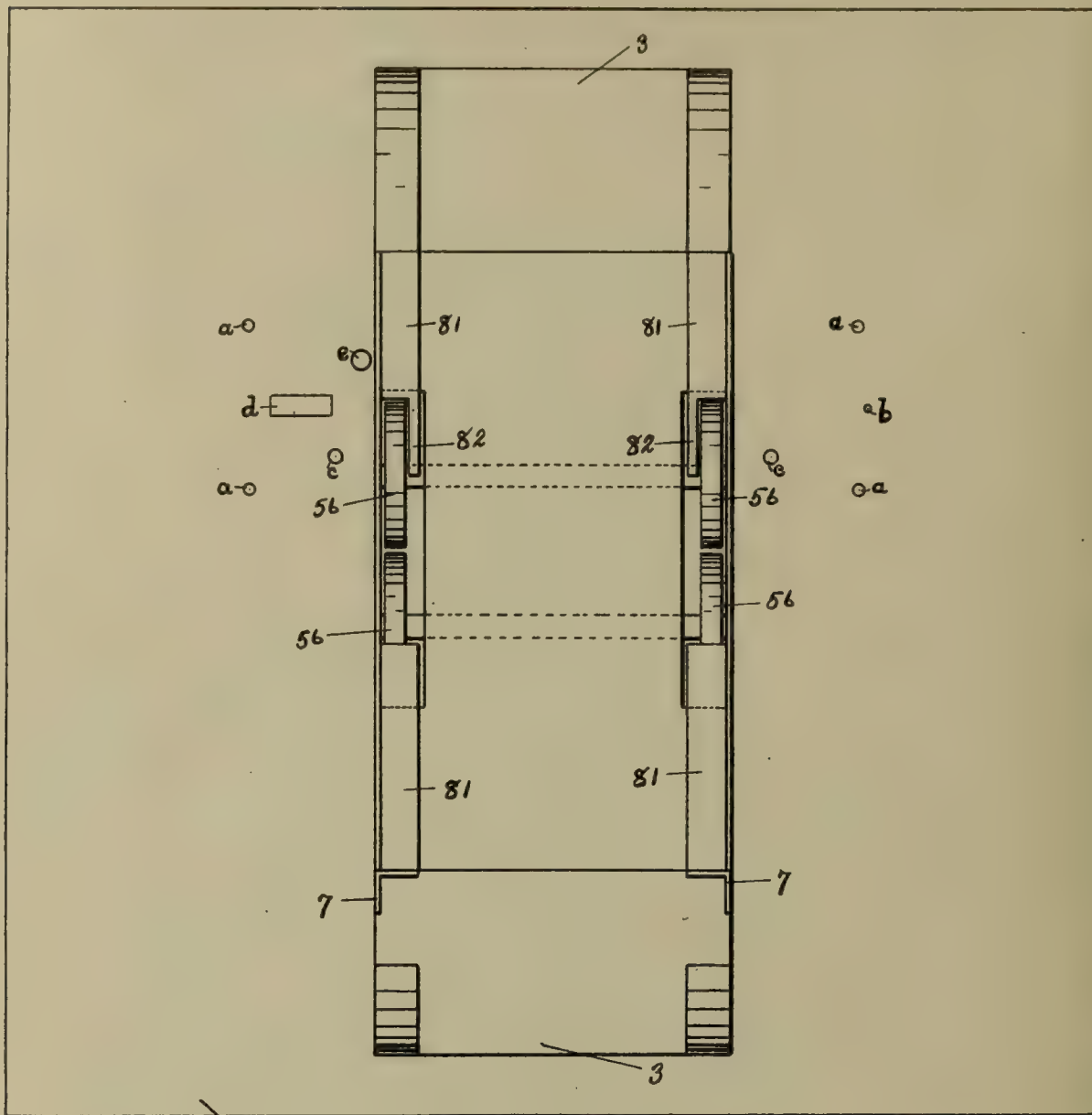


Fig. III.

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 AUTOMATIC PHONOGRAPH OF THE WAX CYLINDER TYPE.
 APPLICATION FILED JULY 11, 1908.

978,014.

Patented Dec. 6, 1910.

6 SHEETS—SHEET 4.

Fig IV.

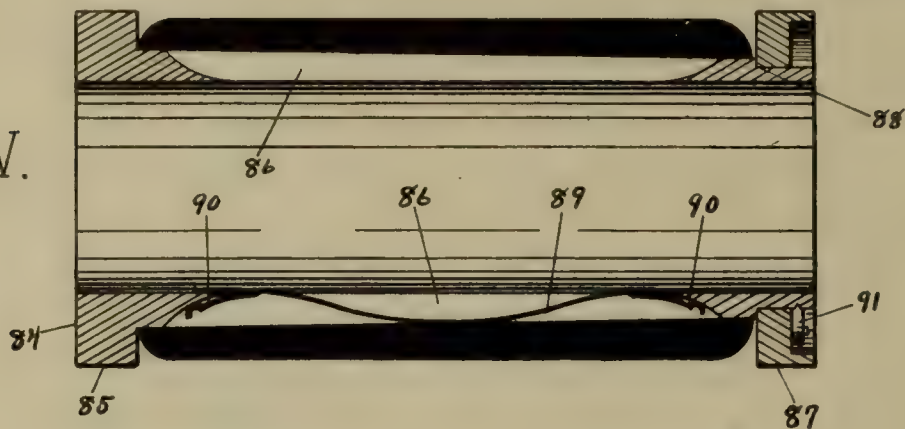


Fig V.

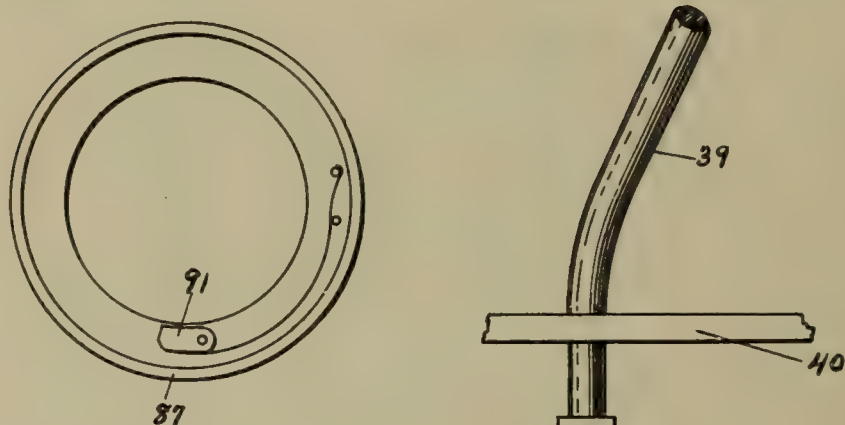
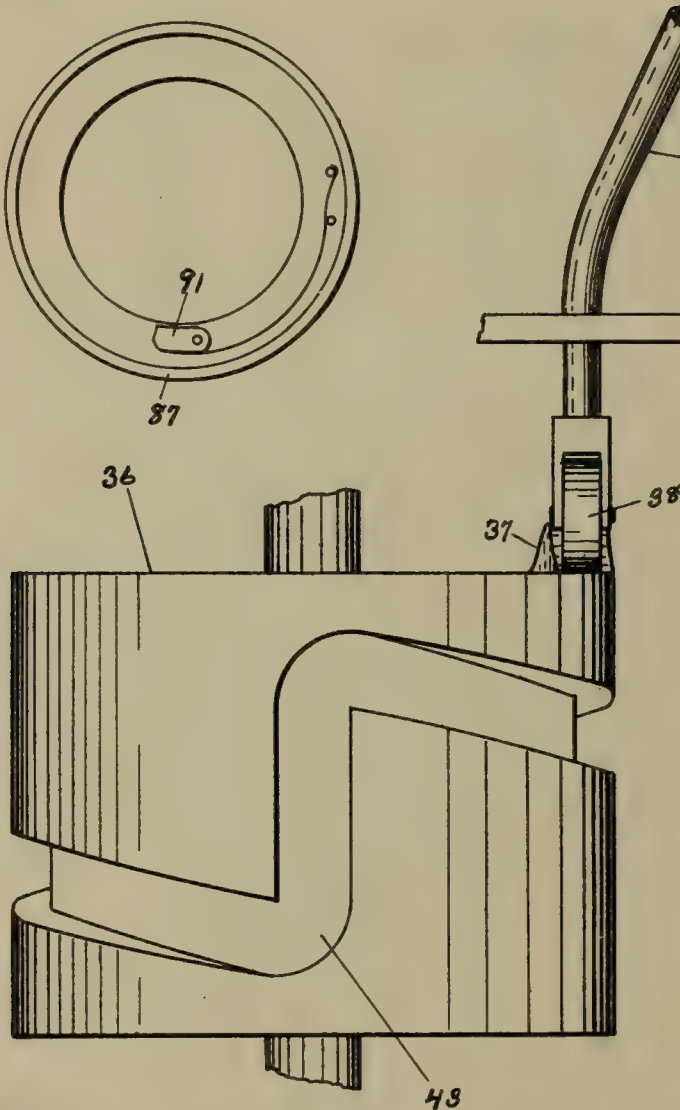


Fig VI.



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6 SHEETS—SHEET 5

Fig VII.

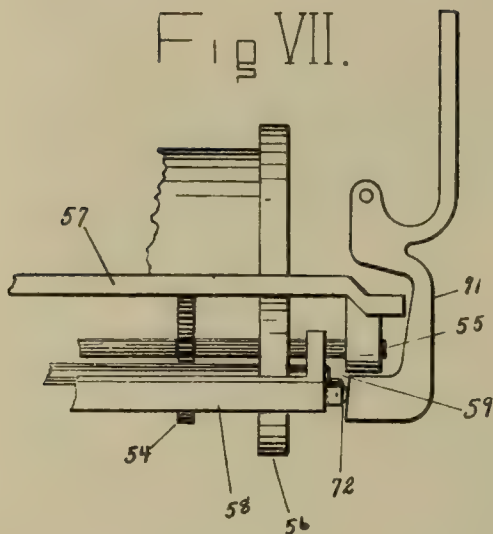


Fig VIII.

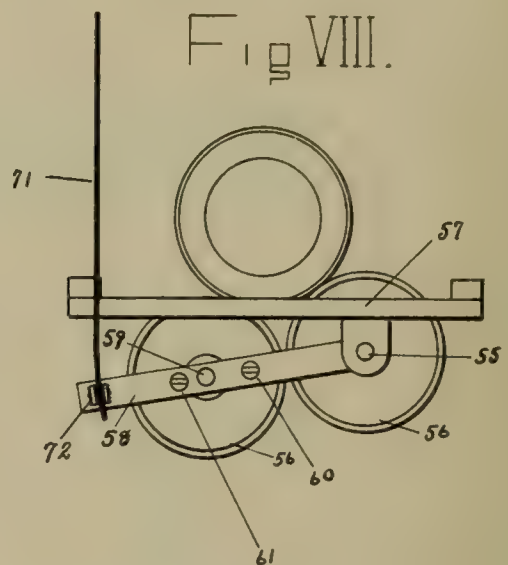
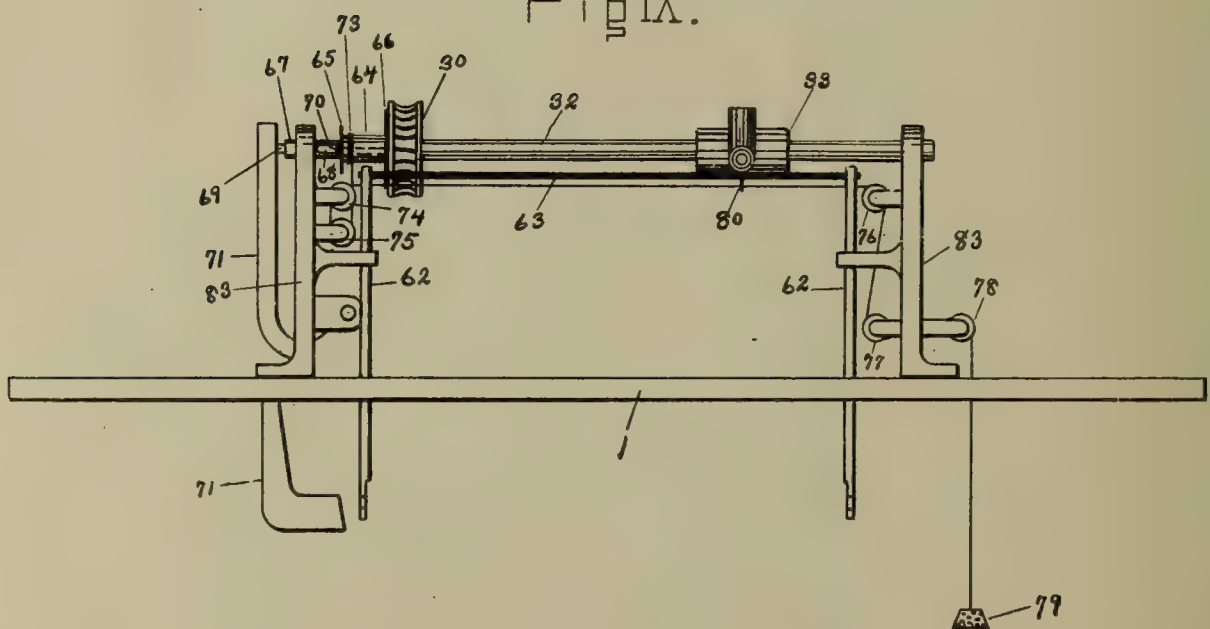


Fig IX.



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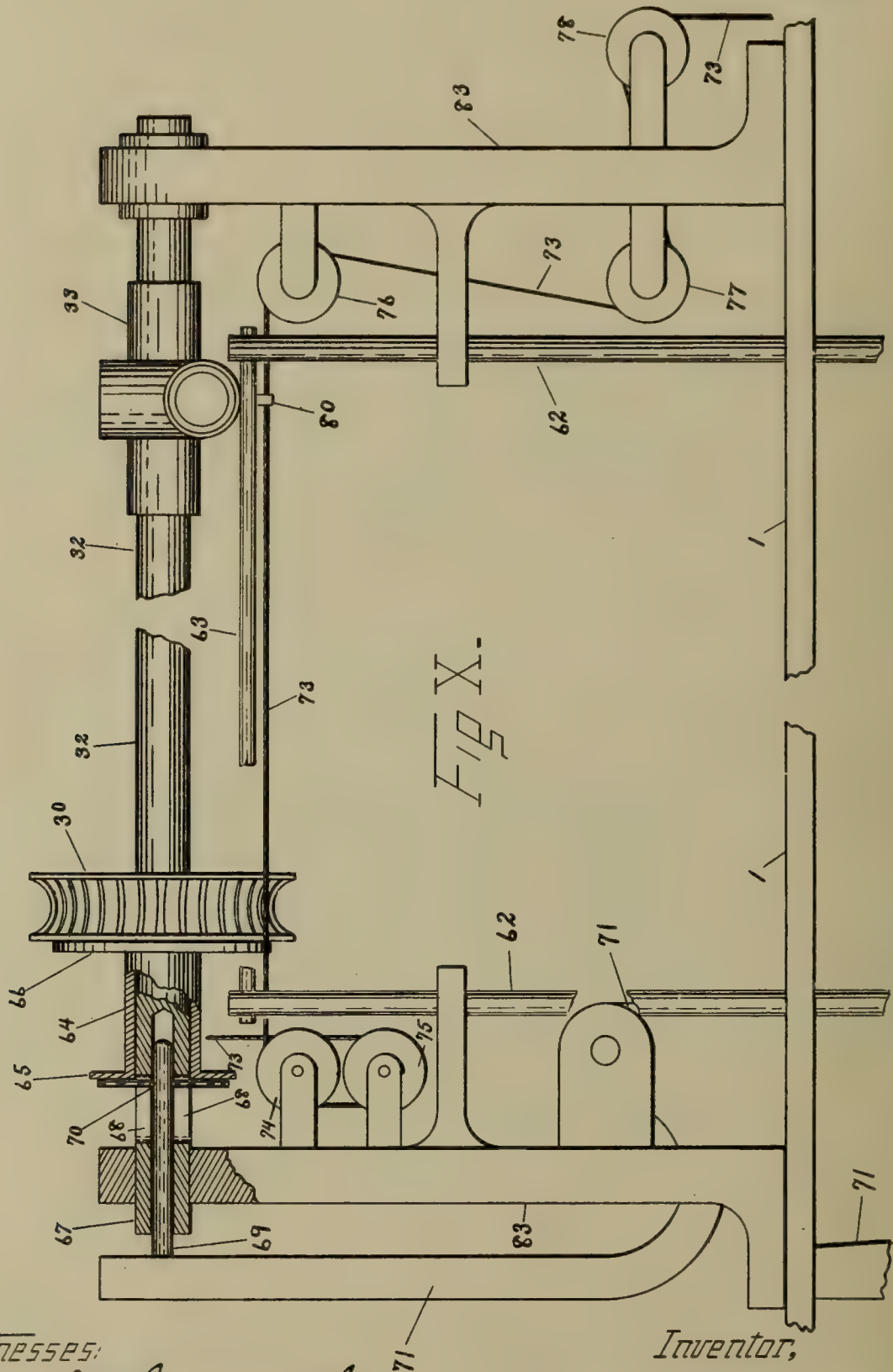
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 APPLICATION FILED JULY 11, 1908.

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6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

JAMES IRWIN GEMMILL, OF CLEVELAND, OHIO.

AUTOMATIC PHONOGRAPH OF THE WAX-CYLINDER TYPE.

978,014.

Specification of Letters Patent.

Patented Dec. 6, 1910.

Application filed July 11, 1908. Serial No. 443,172.

To all whom it may concern:

Be it known that I, JAMES I. GEMMILL, citizen of the United States, resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Automatic Phonographs of the Wax-Cylinder Type, of which the following is a specification.

The principle of the invention is herein explained, and the best mode in which I have applied that principle so as to differentiate it from all other inventions.

My invention relates to automatically operated mechanisms, and particularly to a multiple cylinder record phonograph.

The object of said invention is to produce a talking machine of the character described, which shall be continuous in its action and shall operate for the purpose of reproducing a continuous discourse of music or speech of an indefinite length, as impressed on a series of tablets or phonographic records, which are operated automatically by the machine without any attention or attendance in any way by the operator, and in so operating these tablets or records to do so with the least possible expenditure of time during the silent period of the said mechanism, which occurs between the finishing of one record and the commencement of the next adjacent one. In carrying out this, my object, I have introduced extremely novel mechanical features in the preferred forms of the different mechanisms comprising the machine, which will be hereinafter fully illustrated and described, and in conformity with said illustration and description, will be fully set forth in the claims appended hereto. These results are obtained by the mechanism illustrated in the accompanying drawings which form a part of this specification.

Reference being had at this juncture to the drawings, Figure I, is a vertical view of the machine as seen from the front. Fig. II, a vertical view of the machine as seen from the right hand side of the aforementioned view Fig. I. Fig. III is a plan view of the top of the mechanism, the bottom of which represents the side of the machine as seen in the front of Fig. II, and serves to disclose the arrangement of the inclined planes or ways, serving to conduct records from one side of a magazine to a playing position, and thence to the other side of said magazine. Fig. IV serves to show the preferred form

of record or tablet supporting means. Fig. V discloses a portion of Fig. IV, being an elevation of the section shown at the right hand side of said Fig. IV. Fig. VI is a view of a drum cam which will appear obvious in Fig. I. Fig. VII is diagrammatic, and serves to show a broken portion of a record supporting means in position on means for revolving same, the whole being supported by a movable platform, hereinafter described, and in connection with a lever; the whole forming a part of the mechanism in connection with the upper part of the machine, as seen in Figs. I and II. Fig. VIII is an end view or plan of Fig. VII, further disclosing relative positions of the several parts. Fig. IX is a view of the top plate of the machine together with the mechanism necessary for actuating the sound box to and fro on and over the record tablet being played. Fig. X serves to show in detail some of the parts that are disclosed in Fig. IX.

In a more particular consideration of these drawings, it will be found that similar figures refer to similar parts throughout the same, and again referring to the drawings, in Fig. I, 1 represents the top plate, which is attached to girders, as a supporting means, shown at 2. This plate is perforated, as shown at 3—3, Fig. III, through which is introduced means serving as a magazine for the record supporting means to lie in, and through which they travel. This magazine is shown at 4—4—4—4, Fig. I, and is intimately connected with a pair of castings, one of which is shown at 5, which serves as a connection between the afore-mentioned magazines on the either side, and at the same time, offers a continuous path for the said record tablets, and supporting means for same, as will appear obvious at 6—6—6. These magazines are formed or built up of angular pieces of sheet metal, the shape of which is better disclosed at 7—7 in Fig. III, and are tied together by end and side pieces 8—8, Fig. I. The said castings 5 and the afore-mentioned magazines are supported by means of suspension rods, 9—9, attached to the said castings 5 and the afore-mentioned top plate or platform 1. As a part of the castings 5, it will be noted that I have attached thereto on either side a system of sprocket wheels, shown at 10—10. These sprocket wheels are adapted to carry a pair

of continuous or endless chains, one only of which is shown in Fig. I, and which is made up of a series of peculiarly formed links, as at 11. These links are each and severally supplied with a small roller, shown at 12-12. The chains as a whole are adapted to enter the castings at points 13-13 in Fig. II, and to proceed around the curvature of the said castings on the under side of the record or tablet supports respectively. The chains are adapted, after entering the said openings at 13-13, to roll down around on the flanged projection on said castings, shown at 14-14 in Fig. II, using as a means intermediate between the links of the said chains and the said flanges, the afore-mentioned rollers 12; which it will appear obvious, reduces friction at the traveling point of contact with the castings to a minimum. It will be noted that the portions of the said links at either end, shown at 15-15, Fig. I, are so proportioned that when they are in position in the chain within the castings, they as a whole, for that portion of the chain only, will conform truly to the curvature of the afore-mentioned flanges 14-14. It will appear obvious by this much of my disclosure and description, and especially to those who are skilled in this art, that inasmuch as the said magazines are in the vertical, and inasmuch as the record tablet supporting means are slidable therein, being closely confined, together with the fact that from the point where they diverge from the vertical to the curve necessary for their passage to the other vertical plane, they are supported on an anti-friction traveling curved support, that this method for conveying record tablets and their necessary supports, is accomplished with the least possible friction and retardance.

We will next view the necessary mechanism in connection herewith, which is best shown in Fig. I, and in which 16 is one side of a supporting frame and in turn supported by the said platform 1. This frame supports the motor, 17, connected by a train of gears, 18, 19, and 20, to the first spindle, 21. This spindle also rotates gearing pinion, 22, geared to wheel, 23, rotating spindle, 24. Spindle 24 has two mechanisms thereon which are not disclosed, but of which a duplicate is shown at 25. These mechanisms serve to impart motion by mitered gears from the spindle 24 to the spindle, 26, also spindle, 27. The spindle 27 is connected to the spindle, 28, by means of a pair of the afore-mentioned mitered gears, as disclosed in contact with each other at 29. Said spindle 28 serves to rotate the wormed gear wheel, 30, by means of a worm cut on the extreme upper end, at 31, of the said spindle 28. This worm gear wheel is supported on a shaft, shown at 32, Fig. II, said shaft serving in addition, as a supporting means for a

sleeve, 33, which serves as means to support the reproducer or sound box, hereinafter more fully described.

Referring back to the spindle 26 in Fig. I, it serves to actuate one of two vertical spindles by means of gearing, shown at 34, imparting motion back and forward through quill-gearing, 35-35, which are supported on the two abovementioned vertical spindles and which serve to impart a rotative motion to the drum cam 36. The reduction of motion through this train of quill gears, being such, that the cam 36, makes but one whole revolution during the time required for the complete playing of one record. This drum cam is again disclosed in larger detail in Fig. VI, being viewed from the opposite side, as that seen in Fig. I. It will be noted, as seen in Fig. VI, that this cam has a protuberance, shown at 37, which serves to engage a roller member, 38, in connection with an elevator rod, 39, passing through (as a guide way) the motor platform, 40. The said roller 38 and the protuberance 37 are entirely hidden in the assembly drawing, Fig. I, but the rod 39 and the platform 40 with their relative positions to each other are clearly shown. The use and function of this elevator rod 39 will be hereinafter more fully explained.

A lever, 41, Fig. I, it will be noticed, passes on the farthest side of the cam 36, and at a point central with the cam 36, better defined as at 42. The afore-mentioned lever is designed, to be connected to the said cam, by means of a roller bearing extending sidewise from the said lever and into the milled slot on said cam, shown at 43.

Taking up the relative rotary motions of this mechanism as far as disclosed, we will consider the motor as in action, consequently all of the gearing in motion rotating the several parts in the following relative ratio to each other; considering that the standard speed for a record tablet as now made is one hundred and sixty revolutions to the minute, and to properly give a reproduction of its subject, the ratio of the different speeds of the several different parts are so arranged as to produce three hundred and fifty revolutions of the record support, during one complete revolution of the mechanism as a whole, and this will be found to be sufficient to play the longest record.

Again considering the record tablet supporting means 44 as necessarily making three hundred and fifty revolutions to reproduce its subject, and in connection therewith, said cam 36, I have arranged the intermediate gearing in such a manner as to produce a ratio of movements between the said record support, then in action, and the said cam; in the proportion of three hundred and fifty revolutions for the former, to one revolution of the latter. In connection with said cam

36 and lever 41, the said lever is divided at a point, 45, and the two resultant ends are brought around the magazine, one of which is shown at 46, Fig. I, and both of which
 5 may be seen at 47—47, Fig. II. These lever ends are connected to links, 48, which are in turn connected to slidable members, 49, and one of which is shown in Fig. I, but which are not entirely seen in Fig. II, with the
 10 exception of those portions which are above the platform 1, as shown in Fig. II. This last named pair of members 49 will be again alluded to in connection with the entire action of the machine as a whole.

15 Lever 41, Fig. I, is weighted by a cylindrical weight, shown at 50. Considering the gearing in connection with the afore-mentioned spindle 24 and the gear wheel 23; a gear, 51, supported on spindle, 52, serves to
 20 impart motion through said spindle 52 to a pinion, shown at dotted line position, 53, in contact with a gear wheel, 54, as disclosed in Fig. VII. This gear wheel is supported on and rotates the spindle, 55, shown in Figs. I,
 25 VII, and VIII. This spindle 55 supports the wheels, 56—56, by means of the platform combination of parts 57 and 58, also spindle, 59.

The screw shown in Fig. VIII, at 60,
 30 serves as a connecting point for the afore-mentioned elevator rod 39, and the screw, 61, serves as a connecting point for one of a pair of elevator rods, one of which is shown at 62, Fig. I, and both of which are shown
 35 at 62, Fig. IX. The function of these elevator rods together with their connecting piece at the topmost extremity, shown at 63, Figs. IX and X, will be taken up hereinafter.

40 Considering the shaft 32, as disclosed in Figs. IX and X, as hereinbefore stated, it is rotated by the permanently attached worm gear 30, and in connection therewith I have supplied a slidable moving, rotating
 45 drum, 64, which is free on the shaft 32. This drum, when forcibly engaged frictionally, with the worm wheel 30 it is rotated with same and when it is released from said frictional engagement, it is free to be revolved
 50 and unwound by the string which was wound upon it, the string being actuated by the gravity of the weight 79, in Fig. IX. This drum has a flanged piece, 65, and a larger flanged piece, 66, at the end adjacent to the
 55 worm gear, which is adapted to fit snugly with some friction to the side of said gear, and when so engaged, it will rotate with said gear 30; a sleeve 33, hereinafter again mentioned, is mounted on said shaft 32, and is
 60 free to slide thereon. Said shaft 32 is drilled in from its outermost end, 67, and into this drilled hole, a slot 68, is punctured, passing clear through the entire diameter of said shaft. Within the aforementioned hole in
 65 said shaft I adapt a pin, 69, which extends

to the position and beyond same, indicated at 70. Said indication 70 also serves to show a cross pin, which is attached to the afore-mentioned pin 69, passing clear
 70 through said pin and extending outwardly on either side through the said slot 68 sufficiently far enough to allow said pin 70 to engage the end of the said drum 64, and impinging on the end flanged piece 65.

The member, 71, serves to intimately en-
 75 gage and connect the afore-mentioned pin 69 with the member of the platform combination, shown at 58, Figs. VII and VIII, and by means of a roller anti-friction member, 72, Figs. VII and VIII. The drum 64 when
 80 actuated, serves to wind upon itself a cord, shown at 73, and which is easily traceable through its entire length in Fig. IX, passing over pulley wheels, 74, 75, 76, 77, and 78, extending from last named point down-
 85 ward, and an even tension being kept thereon at all times by a weight, 79. This cord is attached to the afore-mentioned sleeve 33 at a point, 80, and when wound upon said
 90 drum 64, and at the proper speed, it serves to draw said sleeve 33, carrying the reproducer or sound-box, along said shaft 32, as hereinafter described in detail.

As a connecting means between the afore-mentioned magazines 4—4, I show an in-
 95 clined plane or run-way disclosed at 81, Fig. I, and again shown at 81—81—81—81, in Fig. III. The tongued portions of 81—81, in Fig. III, shown at 82—82, serve to carry out the idea of the plane of said run-way
 100 even to a point directly above the common center of the spindle 59, (as seen in Fig. VIII, supporting a pair of wheels 56), and at the same time, allowing sufficient room
 105 between the said tongue and the outermost edges of the said inclined plane for the afore-mentioned wheels to rise through, in conformity with the motion of the portion of the wheel platform combination, shown at
 110 58, Figs. VII and VIII.

The holes in the plate, Fig. III, designated as *a—c—c—c*, are adapted as screw
 115 positions for holding the standards, 83—83, shown more clearly in Fig. IX. The hole, *b*, serves for the cord 73 to pass through. The holes, *c—c*, are adapted to the members 62—62, while the slot, *d*, allows for the free working of the member 71, shown in Figs. VII, VIII, IX and X. The hole, *e*, is
 120 positioned for the accommodation of the vertical shaft 28.

Considering Fig. IV, in which I show a novel means as a support for a record tablet, describing same in detail, 84 shows a
 125 member with an extended flanged end, 85, and which is hollow from end to end, as shown by shading interiorly. This member 84 is disclosed in section showing the position of a record tablet in black. Interstices or slots, shown at 86—86, are milled
 130

or cut on the exterior of the said member 84, said slots being two in number, and extending from the exterior to the interior of said member as shown. At the right hand end of said member 84 I show sectionally a ring, 87, which is adapted to fit on a nicked down portion of said member 84, as disclosed at 88. This ring 87 together with the flared end 85 are both of the same diameter, and slightly larger than the common diameter of a phonographic record tablet. The limited distance between the innermost side of said ring 87 and the flared end 85, as occupied by the said record tablet, is of such a dimension as to allow a very slight lengthwise play of the said record, not for the purpose of allowing the record lee way, but rather to be sure that the afore-mentioned ring 87 will rest uniformly on the member 84 at the position indicated at 88, without binding on the said record. In order to obtain this result, I turn the member 84 down to a diameter small enough to allow the record tablet to freely slip thereon, and for the purpose of securing the rotation of same I depend upon a pair of springs within the slots 86—86, one of said springs only being shown at 89. These springs are held in place as will appear obvious by reason of the spring ends proper being engaged with the innermost side of the member 84 at their two extremities, and being held in that position by spring end members, 90—90, which serve to engage the outermost surface at the two extremes of the milled slot. These springs engage with a firm slight pressure on the innermost side of the wax cylinder record tablet. In further describing the end ring 87, it is held in place on member 84 by means of a spring press clip, 91, engaging with a slot cut for that purpose in member 84. The spring and clip appear obvious in Fig. V.

Before going farther I wish to call attention to the fact that when these record tablet supporting members 84 are in contact with each other at points 85 and 87, that it is physically impossible for one record tablet to touch or interfere with the next adjacent tablet.

Taking up the description of the entire action of this machine, we will assume that the magazine 4 has been filled with record supporting parts 44 in the manner as disclosed in Fig. I, together with the record supporting means with its record as in position at 44 with the reproducer stylus in contact therewith as shown. Upon the motor being started with all of the parts in position as shown, the first action that will take place will be the elevating of the rod 39, which engages the platform member 58, serving to elevate the wheels 56 on the spindle 59 at once elevating the sound box together with the sleeve 33 and the record 44, but in such

a manner due to leverage proportion, as will appear obvious, so that the sound box is removed from off the record, and is continued to be pushed upward by means of the members 62 and the member 63, as shown in Figs. IX and X, the said last action being greater than the upward action of said record supporting means. Immediately upon the record support having been elevated to nearly the extreme of the motion of said members 58, 56, and 59, the said record support 44 has been presented to, and over the top of the wheels 56, and immediately engage the run-way 81 and roll down, falling into a position within the magazine, and thereby resting directly in contact with the last preceding record supporting means. Immediately thereafter, the whole mechanism still being in motion, the cam 36 having advanced slightly, yet sufficiently to bring the vertical part of the milled slot 43, as seen in Fig. VI, in alinement with the afore-mentioned roller bearing on the afore-mentioned lever 41, thereby releasing said lever, which is immediately drawn down, said drawing down being effected by the afore-mentioned weight 50, Fig. I, and thus by means of the divided ends of said lever at 46, links 48 and sliding members 49, causing engagement of the hooked ends of members 49, and shown as 49', with the member 44 just rolled in. The action of this weighted lever and connected parts above mentioned, serves to bring the member 44 down to the position shown at 44'. In thus doing, the whole series of record supports are forcibly displaced, raising the other side of said series proportionately, which said action rolls another member 44 out upon the inclined plane or run-way 81, whereupon it rolls down by gravity to a point where it rolls into the opening between the wheels 56 and the weight thus applied to that combination of wheels connected to the movable member 58 causes the elevator 39 and the members 62, with their relative member 63, to move downward. This motion serves to lower the stylus of the reproducer onto the record the sleeve 33 having been removed to the proper position normally assumed by the said member as a starting position for reproduction of sound. This position was attained during the time that the last named member 44 consumed after it left its revolving position, and prior to its rolling into the magazine. Said motion, to the normal starting position, was produced by the weight 79, as disclosed in Fig. IX, and as hereinbefore described.

The unreeling of the cord 73 was made possible by the fact that the member 58, shown in Fig. VII, was at that time in an elevated position, consequently, the roller member 72 had ceased to exert pressure through contact with the member 71, and

therefore the member 71 had ceased its contact pressure with members, 69, 70, 65, 64, and 66, the action of which would be to allow the said reel 64 to rotate freely on the shaft 32, as shown in Figs. IX and X. Immediately upon the record supporting means having rolled into position with said wheels 56—56, and depressing a portion of that combination, as shown, the member 58 has again caused the portion 72 to engage member 71, producing an opposite effect through member 71, the parts 69, 70, 65, 64, and 66, as last described, thereby causing the member 66 to engage frictionally with the revolving worm gear 30, and at once proceeding to wind up the cord 73, which in connection with member 33 bearing the sound box, proceeds to traverse the revolving record and thus synchronously follow the threaded track on the record being played. The speed of the said worm 30 and shaft 32, Figs. IX and X, is so modulated as to produce this result. The second action of the machine, and so on, are simply repetitions of this action as described, and the members 12—12, 10—10, as shown in Fig. I, constituting the operative members in connection with the castings 5, serve to supply an ever changing, supporting pathway, traveling at all times true as to the common radius, of the path of the afore-mentioned record supporting means, from one vertical plane to the other.

While the form of reproducing machine is a phonograph, as herein shown and described, still it must be obvious that any form of reproducing, or producing mechanism may be used in connection with the several stated features of this mechanism without departing from the spirit or embodiment of this invention in the least.

This machine is not essentially a coin-operated machine, but it may be adapted to be operated by the usual coin slot and switching device for starting and stopping the motor. I wish particularly at this point to call attention to some of the more important features connected in the operation of this, my invention, which will differentiate the same from the prior art as known to me, and which are as follows, to wit:

(1) A series of records are carried entirely through a cycle of motion, each one in contact with its predecessor, and the one superseding it, except at a time in which each individual serial record supporting means must leave that contact, rolling down an inclined plane to a playing position, being played and thence rolling down the said inclined plane into contact with its predecessor.

(2) The records of the series are uniformly spaced apart in the magazine, and fill every position in the complete circuit through which the series moves, and in con-

tact one with the other without any record arbor supporting means, such as an individual or serial supporting means, as is disclosed in the prior art.

(3) The record supporting means are successively displaced from the series and magazine and of their own gravity, roll into a playing position, are played, and are then rolled of their own gravity into another position in the said magazine and series, than from which they were displaced.

(4) The record supporting means in this, my invention, are hollow and are without a central support such as a spindle or a shaft, and are not rotated about their common centers, but are rolled to attain rotary motion, thus differentiating this portion of my invention from all other prior art.

(5) Cylinder records together with their supporting means are bodily displaced from the magazine, and roll from the displaced position into playing position, and are then replaced in a different position in said magazines, without displacing them in their relative positions, in the said series with relation to each other, taking into consideration their individual titles, and the manner of entertainment relative to each individual record.

Having thus described my invention clearly and in conformity with the disclosures or drawings, so that those who are skilled in the art to which this appertains, may make and use same, what I claim and wish to protect by Letters Patent is—

1. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; and means adapted to advance the latter along a portion of a path of movement; said records rolling by gravity to complete their path of movement.

2. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means forming a path along which the latter may travel, said records rolling by gravity along a portion of said path; and mechanical means adapted to advance said records along the remainder of said path, the means forming said path of movement being so arranged relatively to said machine that said records are successively brought into playing position along that portion of their path where they roll by gravity.

3. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; and means adapted to advance the latter along a portion of a path of movement, said records rolling by gravity to complete said movement, whereby said records are successively brought into playing position upon said machine.

4. In mechanism of the character de-

scribed, in combination, a sound reproducing machine; a series of records; mechanical means to advance the latter along a portion of a complete circuit, said records
5 rolling by gravity to complete said circuit, and being successively brought during said gravity-effected advance into playing position upon said machine.

5. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means adapted to advance the latter along a portion of a path of movement intermittently, said records rolling by gravity to complete said
10 movement, whereby said records are successively brought into playing position upon said machine.

6. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; and mechanical means adapted to advance the latter along a portion of a path of movement, said records rolling by gravity to complete said path of movement, said mechanical means
20 acting upon all of said records at a certain time, and gravity being the only positive force acting upon each individual record in completing its path of movement.

7. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means forming a path of movement along which the latter may travel, said records rolling by gravity along a portion of said path; and means
30 adapted to advance said records along the remainder of said path, said advancing means acting upon all of said records for a portion of the path of movement and gravity being the only positive force acting upon
35 each individual record in completing the path of movement, the means forming the said path of movement being so arranged relatively to said machine that said records are successively brought into playing position thereon.

8. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means adapted to bring the reproducer of said machine into playing position; and means adapted to
40 advance said records along a portion of a path of movement, said records rolling by gravity to complete said path of movement.

9. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; and means adapted to bring the reproducing of said machine into playing position; and mechanical means acting to intermittently advance
55 said records along a portion of a path of movement, said records rolling by gravity to complete said path of movement.

10. In mechanism of the character described, in combination, a sound reproducing

machine; a series of records; means adapted to advance the latter along a portion of a path of movement, said records moving by gravity to complete said movement, said force of gravity becoming positively effective subsequent to the commencement of, and
65 consequent upon, the action of said means, said gravity-effected movement resulting in the removal from said series, and the replacement therein, of the records affected thereby, whereby said records are successively brought into relative playing position upon said machine.

11. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means adapted to intermittently advance the latter along a portion of a path of movement, said records moving by gravity to complete said movement, said force of gravity becoming positively effective subsequent to the commencement of, and consequent upon, the action of said means, each gravity-effected movement resulting in the removal from said series, and the replacement therein, of a record affected thereby, whereby said records are successively brought into playing position upon
80 said machine.

12. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; and means adapted to advance the latter along a portion of a path of movement, said records moving by gravity to complete said movement, individual records being subjected to a plurality of gravity-effected movements while traversing their complete path of movement, whereby said records are successively brought into playing position upon
95 said machine.

13. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means adapted to bring the reproducer of said machine into playing position; and mechanical means adapted to intermittently advance said records along a portion of a path of movement, the completion of said movement being effected by the rolling of said records, said completion being consequent upon, and subsequent to, the movement effected by said
100 advancing means, whereby said records are successively brought into playing position upon said machine.

14. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means adapted to bring the reproducer of said machine into playing position; means adapted to advance said records along a portion of a path of movement; the completion of said movement being effected by the rolling of said records, said completion being consequent upon, and subsequent to, the movement effected by said
120 said machine.

advancing means, whereby said machine and said records are successively brought into relative playing position.

15. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means adapted to bring the reproducer of said machine into playing position; and mechanical means adapted to intermittently advance said records along a portion of a path of movement, the completion of said movement being effected by the rolling of said records individually, said completion of the movement being consequent upon and subsequent to the movement effected by said advancing means whereby said records are successively brought into playing position upon said machine.

20. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; and means so arranged and actuated as to cause a record by rolling to assume its playing position upon said machine and to be displaced therefrom.

17. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means so arranged and actuated as to cause one of said records by rolling to assume its playing position upon said machine and to be displaced therefrom; and means adapted to rotate the record while in its playing position.

18. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means so arranged and actuated as to cause a record by rolling to assume its playing position upon said machine and to be displaced therefrom; and means adapted to engage said record by rolling contact while the same is in its playing position.

19. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means adapted to advance said series as a whole, wherein a record forms a part of said advancing means, said means so arranged and actuated as to cause said records by rolling to assume successively their playing positions upon said machine.

20. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means adapted to advance, intermittently, said series as a whole; said means so arranged and actuated as to cause said records by rolling successively to assume their playing positions upon said machine, said rolling motion becoming effective immediately preceding, and immediately subsequent to, the commencement of each of said intermittent advances.

21. In mechanism of the character de-

scribed, in combination, a sound reproducing machine; a plurality of shafts with rollers, said rollers adapted as the only supporting means to retain a record in a playing position upon said machine; means for rotating said shafts; a series of records; means adapted to advance intermittently said series as a whole, each of said advances effecting the movement of a record to its playing position; said records engaging said rollers while the records are in their playing positions so as to be rotated by rolling contact therewith.

22. In mechanism of the character described, in combination, a sound producing machine; a pair of rotary shafts and a frame work therefor, to support the same; roller wheels mounted upon said shafts and adapted as a rolling, supporting means to rotate a record while in its playing position upon said machine; means for rotating said shafts; a series of records; means adapted to advance intermittently said series as a whole, each of said advances effecting the movement of a record to its playing position, where it is rotated; and means adapted to permit said records to move from the rotating position.

23. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means adapted to advance said series as a whole, each of said advances effecting the rolling movement of a record to a playing position relative to said machine; and means adapted to rotate said records while in their respective playing positions; said records also rolling by gravity again into said series.

24. In mechanism of the character described, in combination, a sound reproducing machine; a pair of rotary shafts; roller wheels mounted thereon and adapted as a rolling, supporting means for a record; means for rotating said shafts; a series of records comprising a plurality of communicating columns; means adapted to advance said series as a whole, each of said advances effecting the movement of a record from one of said columns to a position upon said rolling, supporting means which is a playing position relative to said machine; and means permitting the removal of a record from playing position whereby it is permitted to roll back into said series in a column other than that from which it had been advanced to its playing position.

25. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; a magazine for the latter; individual supporting means for said records; and means adapted to cause said records and their individual supporting means successively to roll from said series, assume their playing positions, re-

spectively, relatively to said machine, and to return to said series.

26. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; a magazine for the latter; individual supporting means for said records; and means adapted to cause said records and their individual supporting means successively to move by gravity from said series, assume their playing positions, respectively, relatively to said machine, and return to said series.

27. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; a magazine for the latter; individual supporting means for said records; and means for intermittently advancing said series as a whole, each of said advances effecting the rolling movement of a record and its supporting means to its playing position relatively to said machine.

28. In mechanism of the character described, in combination, a sound reproducing machine and a record; means adapted to support the latter in its playing position; and means adapted to move said supporting means with said record, such movement permitting said record to roll from its playing position.

29. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; means for intermittently advancing the said series as a whole by pressure upon the last record of the series, the records successively rolling into playing position, and means adapted to bring the reproducer of said machine into playing position as each record assumes playing position.

30. In mechanism of the character described, in combination, a sound reproducing machine; a series of records comprising two parallel columns and an intermediate connecting column; a magazine for said series; means for moving said series as a whole, said magazine providing the sole guide-way for said parallel columns during such movement; a separate guide-way for said inter-

mediate column; and other means adapted to bring the reproducer of said machine into playing position, the records rolling by gravity from one of said columns into playing position and from playing position into the other column.

31. In mechanism of the character described, the combination with a sound reproducing machine and a record; of a hollow, tubular record supporting means; means adapted to support the latter in its playing position and to rotate the same, said rotation of the latter producing a playing rotation of the record by rolling contact therewith at both extremities and without further support.

32. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; and means adapted to cause said records, by gravity, to successively leave said series and roll to and assume their playing positions relatively to said machine, and return to said series.

33. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; and means adapted to cause said records, by gravity, to successively roll from said series, assume their playing positions relatively to said machine, and return to the same position in the series, relative to the other records of the series.

34. In mechanism of the character described, in combination, a sound reproducing machine; a series of records; and means adapted to cause said records, by gravity, to successively roll from said series, assume their playing positions relatively to said machine, and return to a different position in the series, but relatively the same with reference to the other records of the series.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES IRWIN GEMMILL.

Witnesses:

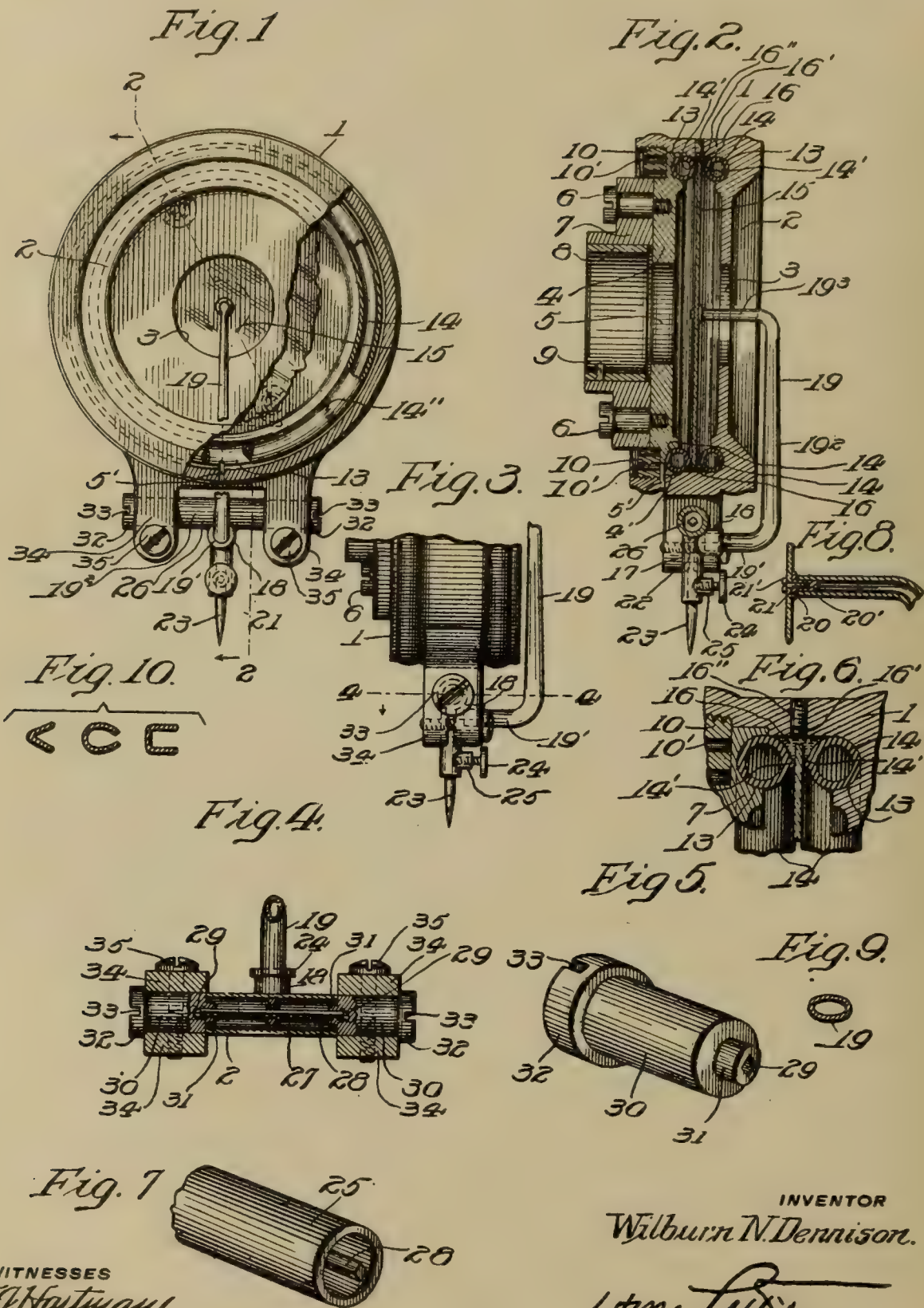
LETA M. GEMMILL.

W. A. TIMS.

W. N. DENNISON.
SOUND BOX.
APPLICATION FILED JULY 13, 1908.

978,566.

Patented Dec. 13, 1910.



WITNESSES
H. J. Hartman.
A. J. Gardner.

BY

INVENTOR
Wilburn N. Dennison.
John F. [Signature]

ATTORNEY

UNITED STATES PATENT OFFICE.

WILBURN N. DENNISON, OF MERCHANTVILLE, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-BOX.

978,566.

Specification of Letters Patent.

Patented Dec. 13, 1910.

Application filed July 13, 1908. Serial No. 443,290.

To all whom it may concern:

Be it known that I, WILBURN N. DENNISON, of the borough of Merchantville, county of Camden, and State of New Jersey, have
5 invented certain new and useful Improvements in Sound-Boxes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

10 The objects of my invention are to provide a sound box casing of durable form consisting of easily constructed parts, few in number, and which may be readily taken
15 apart or assembled; to provide a light and rigid stylus bar; to provide a ring or gasket for the diaphragm which is symmetrical in construction and which is securely seated within the casing; to provide an improved
20 form of pneumatic ring or gasket for the mounting of the diaphragm and to make provisions for inflating said gasket; to provide a torsional spring mounting for the stylus bar which restrains said bar to oscillate in a
25 plane perpendicular to and upon an axis substantially in the plane of the diaphragm, and to provide means for the convenient and accurate adjustment of the tension upon said spring; to provide means for equalizing
30 the cushioning effect of the atmosphere upon the opposite sides of the diaphragm and to prevent the loss of energy by the leaking of air past the diaphragm in order that the full effect of the action of the diaphragm upon the air may be delivered
35 through the outlet of the sound box to the amplifying means; and to provide other improvements as will appear hereinafter.

40 In the drawings, Figure 1 is a front elevation partly in section of a sound box constructed in accordance with this invention; Fig. 2 a section on line 2—2 of Fig. 1; Fig. 3 a fragmentary side elevation of the sound box; Fig. 4 a section on line 4—4 of Fig. 3, looking in the direction of the arrows; Figs. 5, 6, 7 and 8 are enlarged perspective views of details of construction, and Fig. 9 is a sectional view on the line 9—9 of Fig. 2 and Fig. 10 shows modified forms of hollow stylus bars.

50 Referring to the drawings, one embodiment of this invention comprises a sound box casing having a substantially cylindrical outer shell 1, provided with an inwardly extending annular flange integral therewith

upon one end forming the front end 2 of the casing, and provided with an axially circular opening 3 for the admission of the inner end of a stylus bar. The shell 1 has a cylindrical bore opening rearwardly, and
60 having a rearwardly opening annular internal recess forming an annular internal shoulder with the front portion of the bore and within this recess snugly fits a removable back plate 4 forming the rear end of
35 the casing. This back plate 4 has an axial circular opening 5, of a diameter equal to the diameter of the opening 3 in the front end of the casing, and is provided in its edge with a longitudinal key-way 4' adapted
70 to be engaged by a key 5' rigid with the casing to prevent the plate from turning.

For attaching the sound box to the usual tubular sound box arm or support, the rear face of the end plate 4 of the sound box
75 casing has secured coaxially thereto, by means of screws 6, the usual tubular rubber extension 7 provided with a metallic lining 8 and a key 9. The end plate 4 is held in position in the outer shell of the casing by
80 means of a ring 10 having external threads which engage internal threads provided therefor upon the rear end of the interior of the outer shell of the casing, the ring being provided with spanner holes 10' whereby it
85 may be adjusted. The back plate is normally held by the ring 10 so that the inner surface of the plate adjacent its periphery rests against the rearwardly facing internal annular shoulder of the casing.

Oppositely disposed annular grooves 13, are provided upon the inner side of the front end of the casing and upon the inner side of the rear end of the casing, and are arranged coaxially with the casing to receive
95 tubular rubber rings or gaskets 14, respectively, between which is supported a diaphragm 15, the periphery of the diaphragm being preferably spaced from the inner surfaces of the casing.

100 The gaskets are substantially circular in cross section, and are each provided with an annular projecting rib 14' on the side of the gasket contacting with the diaphragm so that the vibrations of the diaphragm will
105 not be affected by a varying surface contact with the gasket. The walls of the grooves 13 containing the gaskets are substantially semicircular in cross section and are adapted to fit closely around the sides of the gaskets
110

to force the gaskets to deliver their full efficiencies.

The gaskets 14 are preferably each constructed from a single piece of tubing, the ends of which may be brought together and joined by a raw rubber or rubber cement, or a continuous rubber tube may be provided with a raw rubber portion as indicated at 14'' and a pneumatic pump, similar to a hypodermic syringe is then inserted through the joint or portion 14'' and the air is forced into the tube to expand it and to give it the desired resiliency, after which the pump is withdrawn from the tube, and the puncture is closed by the self-healing action of raw rubber or similar material, thus retaining the pressure in the tube. This construction provides a gasket which is absolutely symmetrical with respect to the axis passing through the center of the ring, normal to the plane thereof and which will respond uniformly to the vibrations of the diaphragm.

The whole mounting or support for the diaphragm which, in the form illustrated in the drawings comprises the casing and the rings or gaskets 14, forms, with the diaphragm 15 an annular space 16 which incloses the periphery of the diaphragm. This annular space is preferably filled with a liquid, such as water, glycerin or diluted glycerin or other suitable liquid which may be injected between the diaphragm and one of its gaskets, or through the casing after the sound box has been assembled, as through a suitable opening 16' in the casing, which may be afterward closed in any suitable manner as by a screw 16''. This construction prevents losses of energy by the escape of air from the chamber on one side of the diaphragm to that on the other side thereof, and insures the delivery of the full effect of the action of the diaphragm upon the air back of the same, to the amplifier.

The diaphragm is located substantially midway between the opposite inner surfaces of the ends of the casing, dividing the interior of the casing into two chambers, of substantially equal capacity upon opposite sides respectively of the diaphragm which have, as heretofore pointed out axial openings or outlets of substantially equal area. By this means the cushioning effect of the air upon the opposite sides of the diaphragm is substantially equalized.

The stylus bar comprises a light forging 17, forming the lower or outer portion of the bar. This forging is provided adjacent its inner end, with a forwardly extending tubular lug 18 into which is forced or rigidly secured a tubular portion 19 extending substantially the entire distance between the axis of oscillation of the stylus bar and the diaphragm. The tubular portion 19 is preferably bent in any suitable manner, for in-

stance, to form parts 19', 19² and 19³ to clear the sound box casing and to enter the opening 3 in the front of the casing. Within the tubular upper end 19³ of the tubular portion of the bar, may be forced a cylindrical lug 20' projecting from an enlarged portion 20 forming the head of the bar. The head 20 of the bar engages against the outer surface of the diaphragm and is clamped thereto by a screw 21 which passes through the diaphragm, and is threaded axially into the head of the bar, the head 21 of the screw engaging the diaphragm upon its side opposite to the head of the bar, to clamp the diaphragm to the bar.

To increase the rigidity of the stylus bar, the major part of the upper or inner portion 19 of the bar is preferably made substantially oval or elliptical in cross-section, its longer diameter of the cross-section being substantially in the plane of oscillation of the bar, as shown in Fig. 4; but the extreme upper end 19³ and the extreme lower end 19² on the upper portion 19 of the bar are preferably made cylindrical in cross section to facilitate the attachment of the same to the head 20 and the forging 17 respectively. The lower end of the stylus bar is provided with a longitudinal socket 22 substantially in alinement with the plane of the diaphragm and with the axis of oscillation of the stylus bar, to receive the usual stylus needle 23 which may be held in place by a set screw 24 threaded through the lug 25 of the forging 17.

For mounting the stylus bar, the upper end of the forging is preferably formed as a substantially cylindrical sleeve or tubular portion 26 having its longitudinal axis substantially coincident with the axis of oscillation of the stylus bar and substantially parallel to the plane of the diaphragm, the tubular portion projecting in opposite directions from the stylus bar. Centrally within the said tubular portion 26 and substantially in alinement with the stylus socket 22 is a bushing or washer 27 which forms a rigid support for the torsional spring 28 extending therethrough and in opposite directions therefrom forming oppositely extending spring arms spaced from the inner surface of said tubular portion.

The bushing or washer 27 supporting the torsional spring 28 is preferably made of soft steel or brass, and after being positioned in the said tubular portion 26, is preferably compressed by oppositely disposed punches to upset the edges thereof to bring the periphery of the washer in very tight and rigid engagement with the inner surface of the tubular portion 26 and the surface of the spring.

The spring 28 is preferably square, polygonal, irregular, or of any other form than round in cross section to prevent the spring

from turning in the bushing 27 and also so that the ends of the spring may be of suitable shape to fit into the sockets 29 of the keys 30, by which the spring is adjusted and supported, and by which the desired tension is applied to said spring.

The keys 30 are cylindrical in shape and have reduced inner ends 31 containing the sockets 29 and enlarged outer ends forming heads 32 which are slotted as at 33 to receive a screw driver for rotating the keys to adjust the stylus bar and bring torsional stress to bear upon the arms of the spring 28. The keys 30 are rotatably adjustable in the spaced split arms 34 which are rigid with the sound box casing, and the keys are held in any desired fixed positions in the arms by means of the clamping screws 35 which extend through the split portions of the arms. The inner surfaces of the heads bear against the outer surfaces of the spaced arms and the inner ends of the keys bear lightly against the outer ends of the transverse tubular portion of the stylus bar thereby by constraining the bar to oscillate on an axis parallel to the diaphragm.

In adjusting the stylus bar mounting the ends of the spring 28 are rotated in opposite directions from their normal positions, by means of a screw driver acting upon the keys as heretofore stated, and the keys are then clamped into position by means of the clamping screws 35, so that the stylus bar is supported in its normal position, the spring being held subject to a balanced initial torsional tension due to the positions of the keys, thus holding the ends of the spring securely in the keys, but leaving the spring free to respond to the slightest vibration of the stylus bar in a plane perpendicular to the diaphragm.

By making the pivotal portion 17 of the stylus bar of a light forging, the walls of the sleeve 26 and of the lug and of the stylus socket may be made very thin so that the whole stylus bar mounting, including the upper portion 19, is substantially a hollow shell, very strong, but exceedingly light.

Although I have described a construction in which the upper part 19 of the stylus is made hollow, I do not wish to be construed as limited to a strictly tubular form, or flattened tubular form for that part of the stylus bar extending between the point of oscillation of the stylus bar and the diaphragm, inasmuch as a stylus bar, made hollow in any suitable manner, is fully within the aim and scope of my invention. Thus, I may make the upper part of the stylus bar hollow in a number of ways, as by making the same of pressed metal, or any other suitable material, stiffened by webs, as shown in Fig. 10, and when I employ the word "hollow" in the appended claims, I intend it to apply to all the forms like or

similar to those illustrated in the drawings, whether the section be of an open or closed form.

Although I have illustrated the various details of construction whereby all the objects above enumerated may be embodied in one sound box, it is obvious that many of the details may be separately applied to various kinds of sound boxes to great advantage. It is further obvious that my invention is capable of embodiment in many forms, without departing from the spirit of this invention or the scope of the appended claims.

Having thus fully described my invention what I claim and desire to protect by Letters Patent of the United States is:

1. The combination with a diaphragm, of a pair of concentric yielding rings of substantially circular cross section having oppositely disposed circular ribs projecting therefrom engaging against the opposite sides of the diaphragm respectively.
2. A mounting for a diaphragm, comprising a yielding member having a body portion and a projection extending outwardly from said body portion and carried thereby to engage the diaphragm.
3. A mounting for a diaphragm, comprising a yielding member having a body portion, and an annular rib projecting outwardly from said body portion to engage the diaphragm.
4. A gasket for a sound box, comprising a yielding tubular member having a rib projecting therefrom.
5. A gasket for a sound box comprising a yielding tubular member having a self healing portion through which the gasket may be inflated.
6. A gasket for a sound box, comprising a yielding tubular member having a portion composed of raw rubber.
7. A gasket for a sound box, comprising a pneumatic member having a rib projecting therefrom.
8. In a sound box, the combination with a diaphragm, of a pneumatic gasket having a rib thereon in contact with the diaphragm.
9. The combination with a diaphragm, of an inflated gasket contacting therewith for supporting the same, and having an imperforate tubular main or body portion.
10. In a sound box the combination with a diaphragm, of a mounting therefor forming with said diaphragm an inclosed space around the periphery of the diaphragm and means within said space to prevent the passage of air therethrough.
11. In a sound box the combination with a casing, of a diaphragm, means to support said diaphragm in said casing, said means forming with said diaphragm and said casing an annular space inclosing the periphery of the diaphragm and a liquid within said

space to prevent the passage of air there-through.

12. In a sound box the combination with a diaphragm, of a mounting therefor forming with the diaphragm a space inclosing the periphery of said diaphragm and a glycerin seal in said space.

13. In a sound box, the combination with a diaphragm, of a mounting therefor, forming an inclosed space, and a liquid seal in said space.

14. The combination with a stylus bar, of a mounting therefor comprising a torsional spring secured to said bar, a key to turn said spring, said key having one end provided with a socket to receive the end of said spring and its opposite end enlarged to form a head, and means engaging said key and bearing against said head to hold said key in a fixed position.

15. A stylus bar provided with a tubular portion extending axially thereof, a torsional spring fixed in said tubular portion extending longitudinally and spaced from the inner surface thereof, and means to hold the outer end of said spring in a fixed position.

16. The combination with a stylus bar, of a mounting therefor comprising oppositely extending torsional spring arms, keys adjustably secured to the ends of said arms and means to hold said keys in fixed positions.

17. A stylus bar provided with a tubular portion, oppositely extending torsional spring arms secured within said portion and spaced from the inner surface thereof, keys secured to said arms and engaging against said bar, and means to hold said keys in fixed positions.

18. The combination with a stylus bar, of a mounting therefor comprising a torsional spring secured to the bar and having a portion otherwise than round in cross section and a rotatably adjustable key engaging said angular portion to hold the spring in position.

19. The combination with a stylus bar, of a support therefor comprising a yielding member and a bushing surrounding said member and engaging an internal seat provided therefor in said bar, said bushing being compressed into rigid engagement with said member and said seat.

20. The combination with a stylus bar, of a mounting therefor comprising a torsional spring secured to said bar, and rotatably adjustable means supporting said spring and for applying a torsional stress to said spring.

21. The combination with a stylus bar, of a mounting therefor comprising a torsional spring having a portion of square cross section secured to said bar, and a rotatably adjustable key for engaging said portion.

22. The combination with a stylus bar, of a mounting therefor comprising a torsional

spring secured thereto, and rotatably adjustable means held against movement in one direction longitudinally of its axis while being rotated for holding said spring.

23. In a sound box, a stylus bar having a tubular portion, a spring support within said tubular portion and a spring passing therethrough, said parts being rigidly held together by the frictional contact between the same.

24. In a sound box, the combination with a stylus bar, of a spring square in cross section upon which said stylus bar is mounted to oscillate, an adjustable key engaging an end of said spring, and means for holding said key in a fixed position.

25. The combination with a stylus bar, of a torsional spring upon which said stylus bar is mounted, the ends of said spring being of a shape other than round, and means provided with sockets within which the ends of said bar are fitted for applying a torsional stress to said spring.

26. In a sound box the combination with a diaphragm, of a casing surrounding said diaphragm, said casing being provided with openings of substantially equal area upon opposite sides of the diaphragm respectively, a mounting for said diaphragm forming with said diaphragm an annular chamber, inclosing the periphery of said diaphragm, and means in said chamber to prevent the air from passing therethrough.

27. In a sound box the combination with a casing, of a diaphragm mounted therein, forming two chambers of substantially equal capacity upon opposite sides respectively of the diaphragm, said casing having openings of substantially equal area into each of said chambers respectively, and a liquid seal to prevent the passage of air around said diaphragm from one of said chambers to the other.

28. In a sound box, a stylus bar mounted to oscillate in a fixed plane, said bar having a hollow portion oblong in transverse section and with its longer transverse diameter extending in the plane of oscillation of said bar.

29. In a sound box, a stylus bar having a hollow tapering upper portion oblong in transverse section, extending substantially from the axis of oscillation of said stylus bar, to the upper end thereof.

30. In a sound box, a stylus bar having a transversely oblong tubular portion.

31. In a sound box, a stylus bar having a tubular inner end and an engaging member forced into said tubular end.

32. A sound box casing comprising a hollow shell having an internal rearwardly facing annular shoulder, a removable back plate resting in said shell against said shoulder, and a ring in said shell in the rear of said plate, for holding said plate in position.

33. A sound box casing comprising a hollow shell having an internal rearwardly facing annular shoulder, a removable back plate resting in said shell against said shoulder, a
5 ring in said shell in the rear of said plate, for holding said plate in position, and a diaphragm in said casing in front of said back plate, and a yielding gasket between said diaphragm and said back plate, and in contact with said back plate.
10

34. A sound box casing comprising a hollow shell having an internal rearwardly facing shoulder, a removable back plate fitting in said shell in the rear of said shoulder, and
15 a ring in said shell in the rear of said back plate, for holding said plate in position.

35. A sound box casing comprising a hollow shell provided with an open end, a plate fitting in said open end, a diaphragm in
20 said casing inside of said plate, means rigid with said casing for limiting the movement

of said plate toward said diaphragm, yielding means between said diaphragm and said plate and held in position by said plate, and means for holding said plate against outward movement with respect to said casing. 25

36. A sound box casing comprising a hollow shell provided with an open end, a plate forming a closure for said open end, a diaphragm in said casing inside of said plate, 30 means for limiting the movement of said plate toward said diaphragm, a yielding gasket between said diaphragm and said plate and held in position by said plate, and means for clamping said plate against said
35 gasket.

In witness whereof I have hereunto set my hand this eleventh day of July, 1908.

WILBURN N. DENNISON.

Witnesses:

DEAN S. RENWICK,

ROBERT H. CRAWFORD.

O. J. FAJEN.

RECORD.

APPLICATION FILED JULY 28, 1910.

978,722.

Patented Dec. 13, 1910.

Fig. 1.

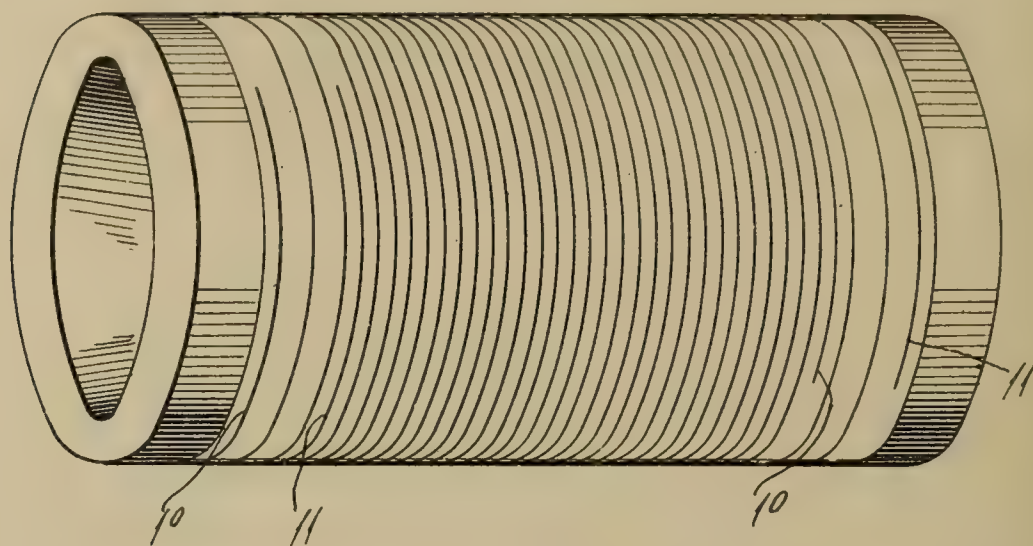
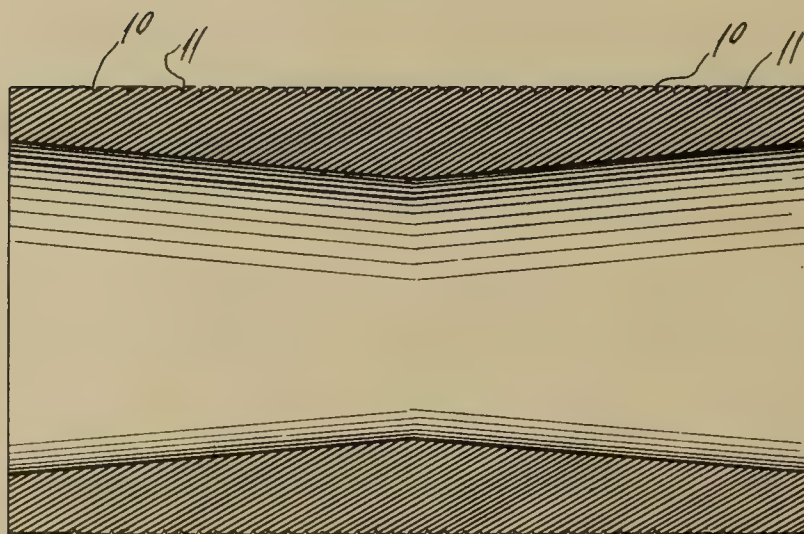


Fig. 2.



Inventor
Otto J. Fajen

Witnesses
Jos. Gregory

Henry T. Bright

By

Charles Chandler

Attorneys

UNITED STATES PATENT OFFICE.

OTTO J. FAJEN, OF STOVER, MISSOURI.

RECORD.

978,722.

Specification of Letters Patent. Patented Dec. 13, 1910.

Application filed July 28, 1910. Serial No. 574,289.

To all whom it may concern:

Be it known that I, OTTO J. FAJEN, a citizen of the United States, residing at Stover, in the county of Morgan, State of Missouri, have invented certain new and useful Improvements in Records; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as it appertains to make and use the same.

This invention relates to records for sound reproducing machines and particularly that type of records which are tubular in form.

The object of the invention is to provide a sound record of this type with a pair of sound grooves starting respectively at opposite ends of the record; and in further providing said record with a bore tapering from each end toward its center whereby same may be reversibly mounted upon a holder in order to seat a style in the starting end of either groove.

With these and other objects in view the invention consists in the details of construction and in the arrangement and combination of parts as will be hereinafter more fully described and particularly pointed out in the appended claim.

In describing the invention in detail reference will be had to the accompanying drawings wherein like characters of reference denote corresponding parts in the several views; and in which,

Figure 1 is a perspective view of a tubular record constructed in accordance with the invention; and, Fig. 2, a longitudinal section of same.

Referring to the drawings, the record is shown as provided with a pair of substantially parallel sound grooves 10 and 11, the groove 10 starting at one end of the cylinder, while the groove 11 starts at the other end of the cylinder. The termination of

the groove 10 is inward of the starting end of the groove 11 and is separated therefrom by a plurality of convolutions of the groove 11. Likewise, the termination of the groove 11 is inward of the starting end of the groove 10 and is separated therefrom by a plurality of convolutions of the groove 10.

In order to reversibly mount the cylinder upon the usual tapering holder of a sound reproducing machine so that the style of the machine may be seated in the starting end of either of the grooves 10 and 11, the bore of the cylinder is tapered from each end toward its center; such a construction enabling the cylinder to be readily reversed upon the holder of a machine as will be apparent.

By terminating one groove inward of the starting end of the other groove and separating such termination, of one groove from the starting end of the other by a plurality of convolutions of the latter, the operator is enabled to seat the style of the machine with certainty in a desired groove.

What is claimed is:

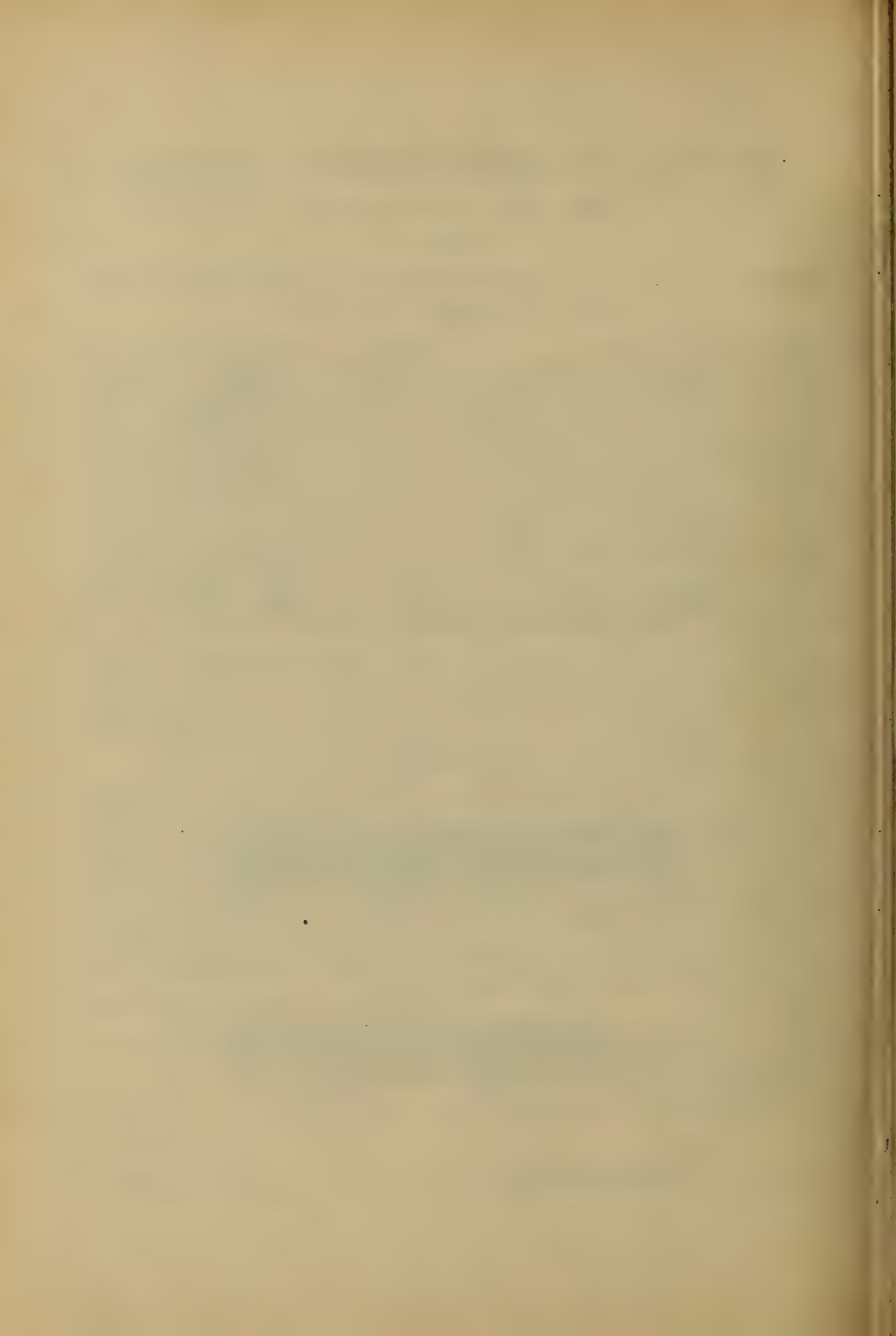
A tubular sound record having thereon a pair of substantially parallel grooves beginning at opposite ends of said record respectively, the termination of one groove being disposed inward and separated from the beginning of the other groove by a plurality of convolutions of the latter and said record also having its bore tapered from each end toward its center whereby the same may be reversibly mounted on a holder in order to seat a style in the starting end of either groove.

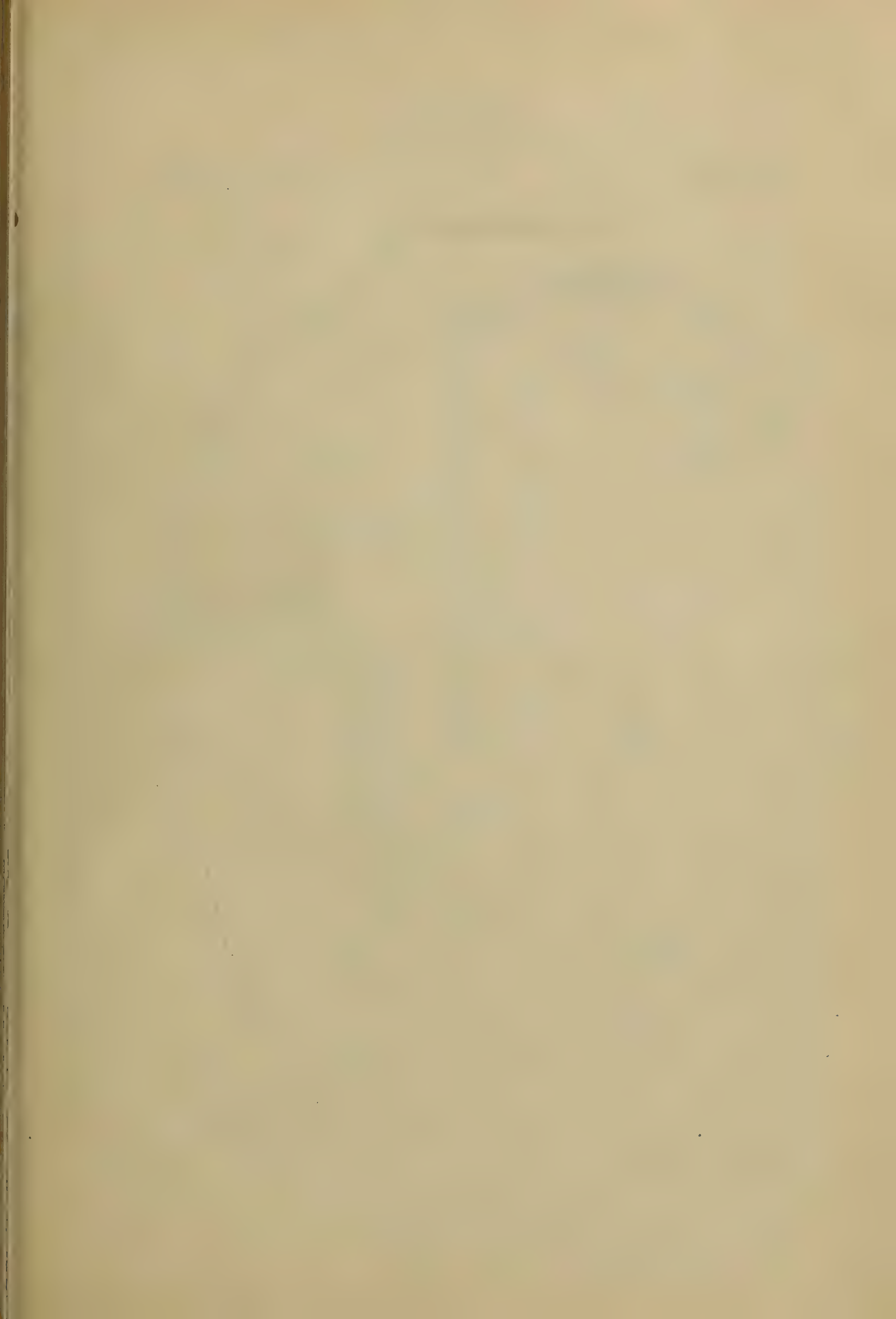
In testimony whereof, I affix my signature, in presence of two witnesses.

OTTO J. FAJEN.

Witnesses:

L. S. HATTMAN,
H. L. FUICH.





A. JACCARD.
TALKING MACHINE.
APPLICATION FILED DEC. 2, 1908.

978,891.

Patented Dec. 20, 1910.

2 SHEETS—SHEET 1.

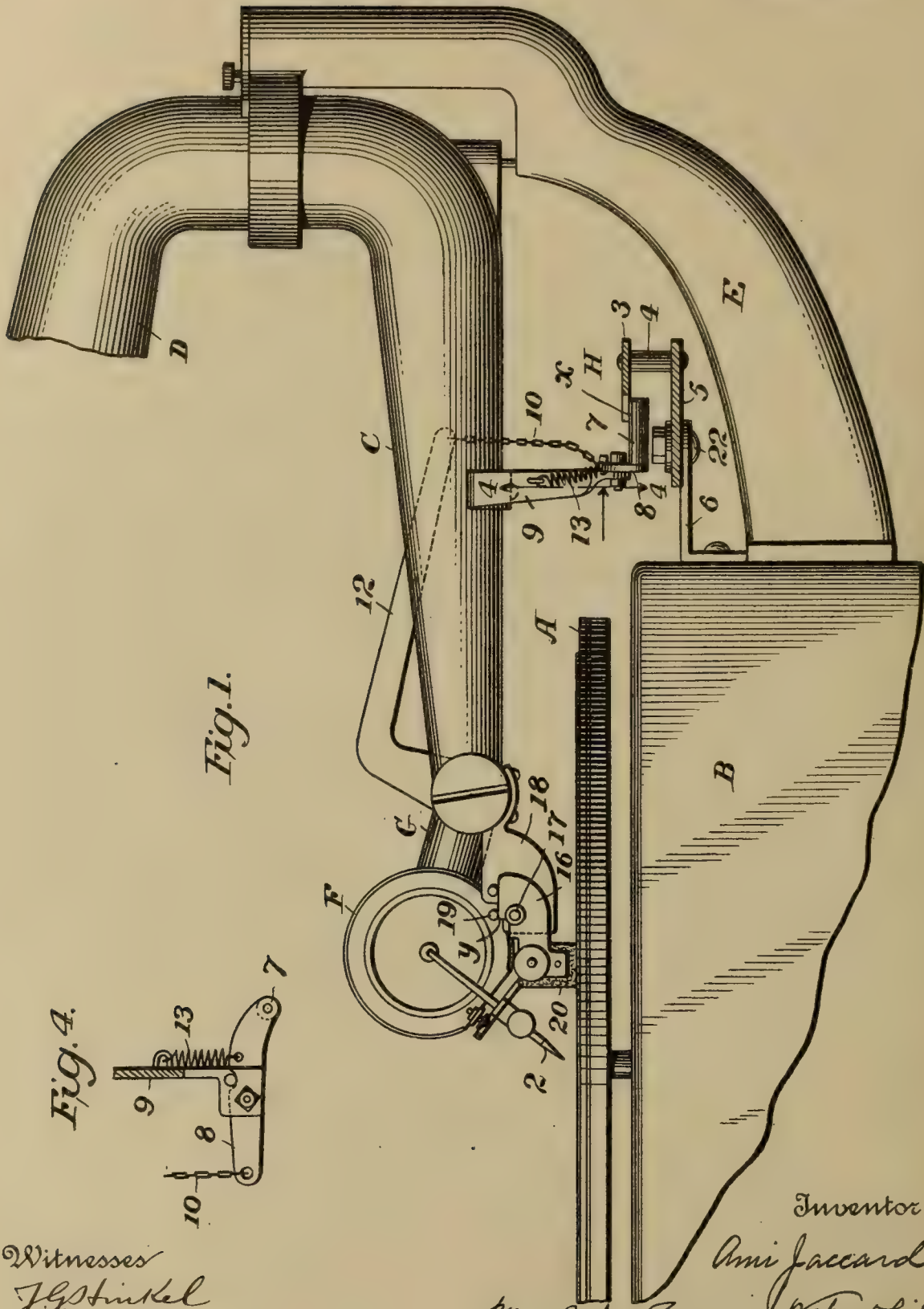
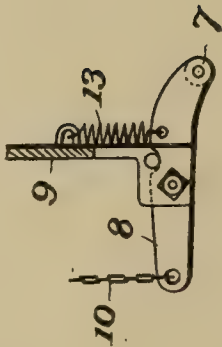


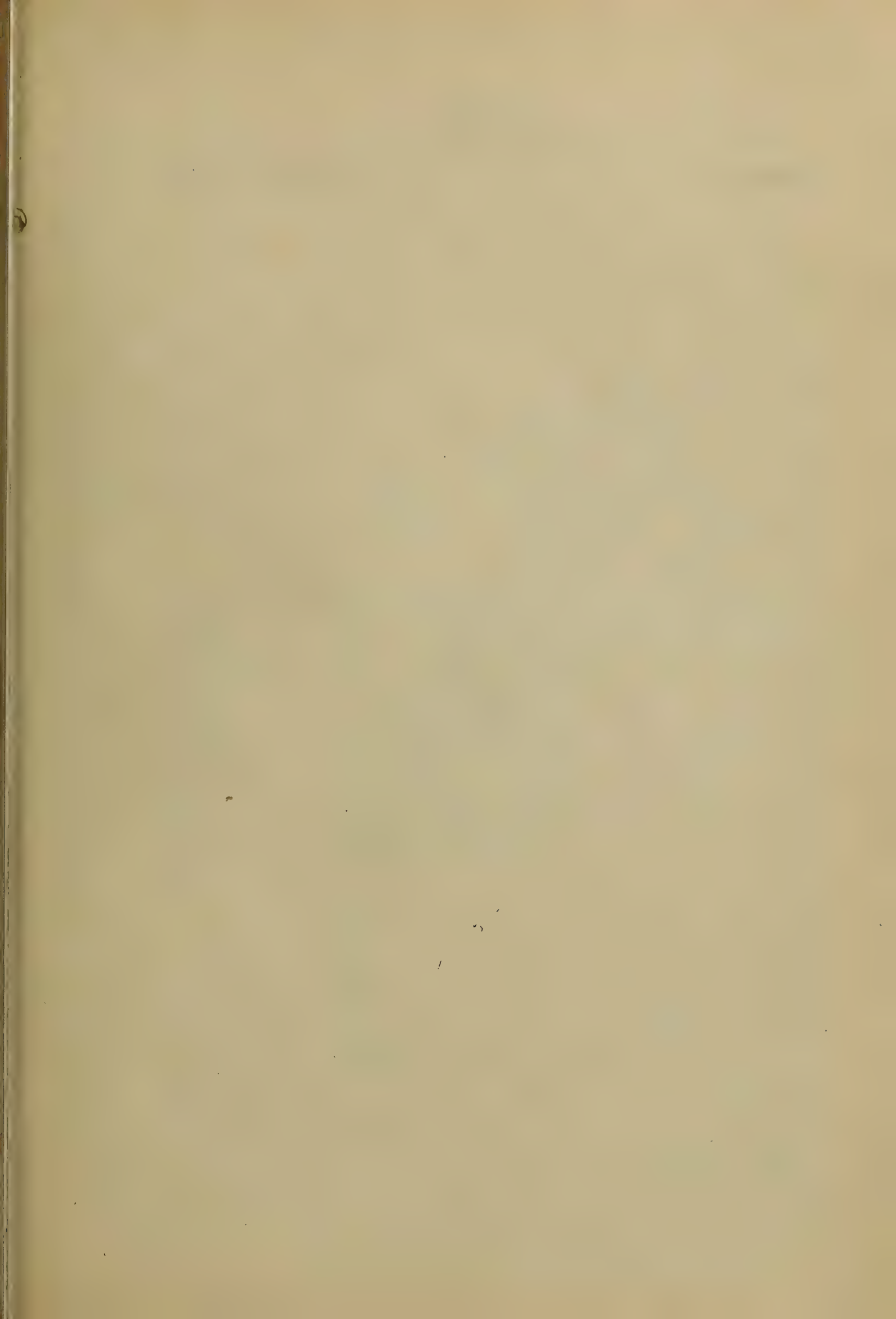
Fig. 1.

Fig. 4.



Witnesses
J. G. Stinckel
J. J. McCarthy

Inventor
Ami Jaccard
by John Freeman, Walter List
Attorneys



A. JACCARD.
TALKING MACHINE.
APPLICATION FILED DEC. 2, 1908.

978,891.

Patented Dec. 20, 1910.

2 SHEETS—SHEET 2.

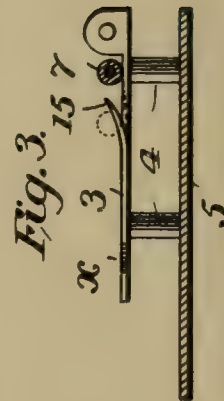
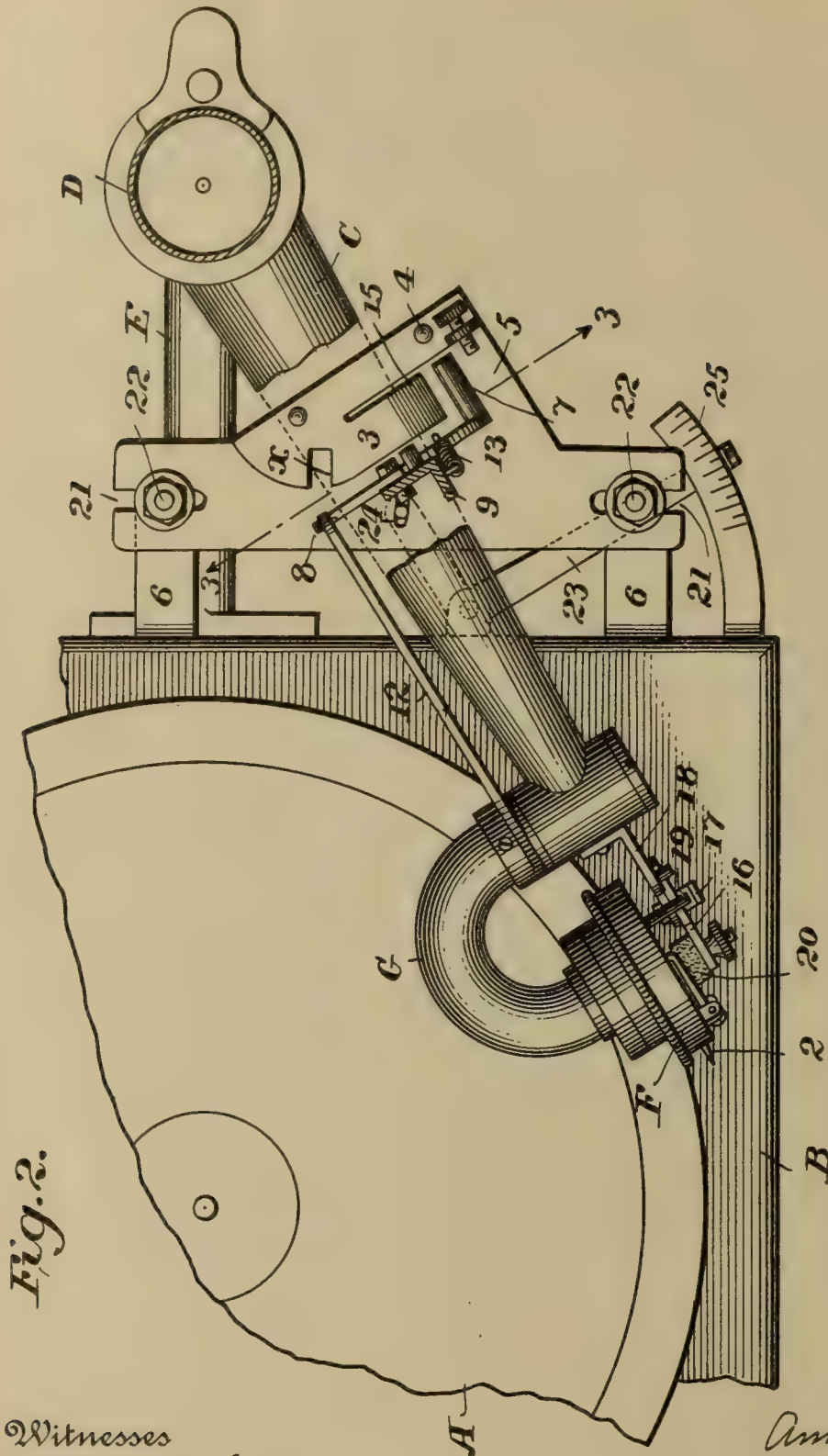


Fig. 2.

Fig. 3.

Witnesses
J. G. Stinckel
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Inventor
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by John Freeman, Walter C. Pitt

Attorneys

UNITED STATES PATENT OFFICE.

AMI JACCARD, OF NEW YORK, N. Y., ASSIGNOR TO T. EPHREM LA MONTAGUE, OF
NEW YORK, N. Y.

TALKING-MACHINE.

978,891.

Specification of Letters Patent.

Patented Dec. 20, 1910.

Application filed December 2, 1908. Serial No. 465,703.

To all whom it may concern:

Be it known that I, AMI JACCARD, a citizen of the Republic of France, and resident of New York, in the county and State of New York, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

My invention relates more particularly to that class of talking machines in which the record is upon a flat circular disk, and consists in means whereby to prevent those portions of the disk which do not have any record upon them from being brought in contact with the needle, and also in means whereby to prevent the needle from being carried radially across the record or from being improperly brought against the disk, which improved features may be used together or separately and in some cases in connection with talking machines of a different character, all as fully set forth hereinafter and illustrated in the accompanying drawing, in which:

Figure 1 is a side elevation showing sufficient of a talking machine to illustrate my improvements, the parts being in the position which they occupy when the needle support is held in place by a detent adapted to be automatically shifted by the disk; Fig. 2 a plan view; Fig. 3 an edge view of the stationary portion of the shifting device; Fig. 4 a transverse section on the line 4—4 Fig. 1.

I have illustrated my invention in connection with that character of talking machine in which the rotatable disk A containing the record is supported upon the box B, and the tone tube C and its associated horn D swing upon a stationary bracket E so as to carry the tone tube and sound box F over the face of the record, the needle 2 carried by or with the sound box being thus caused to traverse the record to and from the center thereof. My invention however can be as well used in connection with other forms of apparatus and whether the needle traverses the record or the latter moves beneath the needle supported upon a relatively stationary tube. As shown the sound box F is pivoted to swing upon the tube C, being supported by a movable carrier or support G, but the said support may be otherwise retained movably in respect to the tone tube

in order that the needle may be carried to an operative position to contact with the record disk or out of such position.

With the above described parts, which may be of any ordinary or suitable construction, I combine a shifter device H and suitable connections of such a character as will insure the shifting of the needle support as the needle reaches the limit of its inward movement, or the inner limit of the record, to thereby lift the needle so that it will not be brought into contact with the part of the disk at the center which has no record upon it, and also so that in returning the needle toward the periphery of the record it cannot traverse in contact with and scratch the latter. As shown the shifter device H is supported in a stationary position adjacent to the box or bracket, and consists of a blade 3 supported upon studs 4, upon a plate 5 which in turn is supported by brackets 6 connected with the box, and the blade 3 is so constructed and arranged as to coact with parts connected with the needle support G to cause the latter to swing downward as the needle is brought into operative position to bear upon the record near the periphery of the disk, and insure the upward movement of the needle when it reaches the desired limit of its movement toward the center of the disk. While this blade is constructed and combined with different connections to secure this result, I have shown the blade so constructed as to be engaged by the lateral arm 7 of a lever 8 pivoted to a bracket 9 connected with the tone tube C, the other end of the lever being connected by a chain 10 to an arm 12 of the swinging support G, and a spring 13 connected to the bracket 9 and to the outer end of the lever 8 tends to carry the latter to such a position that the lever 12 will be held in position to bring the needle 2 above the plane of the record on disk A. As the tone tube C swings inward, the pin 7 of the lever will be brought below the blade 3 and the outer end of the lever will be thereby depressed, raising the inner end and allowing the sound box to descend, bringing the needle into contact with the record. The parts remain in this position until the needle reaches the inner limit of the record, and the plate H is so proportioned that as the needle

reaches said position the pin 7 of the lever 1 will escape the inner edge *x* of the blade 3, when the spring 13 will swing the outer end of the lever 8 upward, depressing the inner end and thereby rock the lever 12 to swing the needle support so as to carry the needle upward and away from the record. In this position the tone tube may be swung outward without any danger of scratching the record by the needle.

In its outward movement the pin 7 of the lever 8 is carried over the top of the blade 3, and in order that when the tone tube is swung inward the said pin may pass beneath the said blade, means must be provided whereby the said pin may be lowered, and I therefore turn the outer end 15 of the blade upward, as best shown in Fig. 3, and make this portion of spring metal or flexible so that it will yield as the pin 7 passes outward, swinging to the position shown in dotted lines Fig. 3, until the pin 7 escapes, when it will spring upward so as to depress the pin when the latter is again carried inward. Any other desired means for insuring this action may be employed. After the tone tube swings outward and is then again swung inward to bring the pin 7 in contact with the shifting blade, the needle holder would at once be depressed and the pin might be brought in contact with the edge of the record disk or lowered before it was in proper position. To prevent such a result I combine with the adjustable support for the needle a suitable detent which will automatically engage said support and hold it in its upper position whenever the support is swung to this position. As shown in Figs. 1 and 2 the said detent consists of an arm 16, pivoted at 17 to a bracket 18 secured to the tone tube and tending to swing by its weight to the position shown in Fig. 1, and thereby bring its upper edge beneath a pin or other projection 19 of the needle support, the detent taking this position as soon as the needle support is elevated, as aforesaid, when the needle reaches the desired limit of its inward movement. It will be evident therefore that when the shifting devices are operated so as to relax the chain 10, as the tone tube swings inward the needle support will not swing or move downward at once, and it is necessary to shift the detent 16 in order to bring the needle to operative position. In order that this shifting may be effected automatically at the proper moment, I provide means whereby the detent is swung only after the needle is above the record disk and the detent is in position to coact therewith. To this end I provide the detent with a shoe 20 in the form of a pad of felt or other soft material adapted to engage the roughened surface or record of the disk. When therefore the shoe of the detent engages such surface, and the disk is rotating, by its contact with the shoe it will tend to lift the outer end of the detent, when its upper edge will escape the pin 19 and the latter and the associated needle support will swing downward, a shoulder *y* of the detent then preventing the latter from again assuming its normal position until the needle holder is lifted at the termination of its recording operation, when the detent will swing downward and bring its upper edge beneath the pin 19.

Inasmuch as all of the record disks in use are not of the same dimensions, that is, the record portion does not always terminate at the same distance from the center of the disk, it is desirable to adapt the shifting devices to these varying conditions, which may be done by providing means for adjusting them upon their support. As shown the plate 5, which supports the blade 3, is connected with the brackets 6 so as to slide longitudinally thereon. As shown the plate has slots 21 through which extend pins or screws 22 into the arms of the brackets 6, and by sliding the said plate 5 upon the support the terminal edge *x* of the shifting blade may be brought to any position required to cause the shifting of the needle support at any desired period of the operations. One means of thus shifting the parts consists of an L-shaped lever 23 pivoted to a bracket, provided with a pin 24 extending into a slot of the plate 5, the outer arm of the plate traversing a graduation or scale upon an arm 25 extending from the bracket 6, but any other suitable shifting means may be employed.

Without limiting myself to the construction shown, I claim:

1. The combination with the swinging tone tube of a talking machine, the needle, and the swinging support for the needle, of a lever supported on the tone tube and connected with the needle support, and means for automatically rocking said lever to lift the needle as the tone tube reaches the desired limit of its movement in one direction.
2. The combination with the swinging tone tube of a talking machine, the needle, and the swinging support for the needle, of a lever supported on the tone tube and connected with the needle support, a spring acting on said lever to lift the needle support, and means for automatically rocking the lever against the action of said spring and maintaining it in such adjusted position during a predetermined portion of the swinging movement of said tube in one direction.
3. The combination of the swinging tone tube and needle and movable support therefor of a talking machine, a lever moving with the tone tube and connected with said support for raising and lowering the latter,

and a bearing arranged to make contact with said lever to swing the latter and lower said support as the needle is brought into operating position.

5 4. The combination with the swinging tone tube of a talking machine, of a needle, a swinging support for the needle, auto-
10 matic means for moving said support to lift the needle as the tone tube reaches the de- sired limit of its inward movement, and a
detent carried by the tone tube for engaging and holding said support when elevated.

5 5. The combination with the swinging tone tube of a talking machine, of a needle, a swinging support for the needle, auto-
15 matic means for moving said support to lift the needle as the tone tube reaches the de- sired limit of its inward movement, and a
detent for engaging and holding said sup-
20 port when elevated, said detent provided with a shoe for engaging the record.

6. The combination with the swinging tone tube of a talking machine, of a needle, a swinging support for the needle, auto-
25 matic means for moving said support to lift the needle as the tone tube reaches the de- sired limit of its inward movement, and a
detent for engaging and holding said sup-
30 port when elevated, said detent provided with a yielding shoe for engaging the record.

7. The combination with the swinging tone tube and needle and needle support movable on said tube, of a needle shifter comprising a fixed shifting device over
35 which the tone tube swings, and parts con- nected with the needle support to contact with said device on swinging the tone tube.

8. The combination with the swinging tone tube, needle and support for the needle
40 movable on said tube, of a lever supported on the tube and connected with said needle support, and a fixed shifting device ar- ranged to make contact with and shift said
45 lever as the needle is carried to operative position.

9. The combination with the needle of a talking machine, of a support for said needle movable to carry the needle to and from a rec-
50 ord and adapted to swing laterally, of means constantly acting to hold the needle ele- vated, and means for rendering said lifting
means inoperative during a predetermined portion of each lateral movement of the needle.

55 10. The combination with the needle of a talking machine, of a support for said needle, movable to carry the needle to and from the record, means for shifting said support to lift the latter as the needle
60 reaches the inward limit of a record, and a detent carried by said support for automati- cally engaging and holding the support in its shifted position.

65 11. The combination with the needle of a talking machine, of a support for said needle

movable to carry the needle to and from the record, means for shifting said support to lift the latter as the needle reaches the in-
ward limit of a record, a detent for auto-
matically engaging and holding the support
70 in its shifted position, and means for shift- ing the detent to release the support when the needle is brought to position to engage a record.

12. The combination with the tone tube, 75 sound box pivoted thereto and needle car- ried by said box, of a lever supported on said tube and connected with said box, and a shifter plate supported to make contact with and swing said lever as the needle is
80 carried into starting position over a record.

13. The combination with the tone tube, sound box pivoted thereto and needle car- ried by said box, of a lever connected with
85 said box, and a shifter plate supported to make contact with and swing said lever as the needle is carried into starting position over a record, said parts arranged to release the lever as the needle reaches the desired
90 limit of its inward movement.

14. The combination with the swinging tone tube, sound box pivoted thereto and needle carried by said box, of a lever sup-
ported on said tube and connected with said
95 box, and a shifter plate arranged to make contact with said lever to lower the support as the needle reaches starting position and proportioned to permit the lever to pass from contact therewith as the needle reaches
100 the inward limit of a record.

15. The combination with the swinging tone tube, sound box pivoted thereto and needle carried by said box, of a lever sup-
ported on said tube and connected with said
105 box and adjustable, and a shifter plate sup- ported to make contact with and swing said lever as the needle is carried into starting position over a record.

16. The combination with the movable needle support of a talking machine, of a
110 detent moving with the needle support and arranged to engage and hold said support when raised, and means for automatically lifting the support when the needle reaches the inner limit of a record. 115

17. The combination with the movable needle support of a talking machine, of a
120 detent mounted to move with the needle sup- port and adapted to coöperate therewith to hold the needle in an inoperative position, and means for automatically bringing such detent into action when the needle reaches the end of a record.

18. The combination with the movable needle support of a talking machine, of a
125 detent mounted to move with the needle support and adapted to coöperate therewith to hold the needle out of contact with a record, means rendering said detent inop-
erative when the needle is engaging a record, 130

and means for automatically bringing the detent into action as the needle reaches the end of the record.

19. The combination with the movable
5 needle support of a talking machine, of a
detent arranged to automatically engage
and hold said support when raised, and a
shoe carried by the detent in position to en-
10 gage a record as the detent is brought above
the latter.

20. In a talking machine, the combina-
tion with a record, a sound box, means
whereby a relative movement may be ef-
15 fected between said record and box so that
the latter may be supported with its needle
beyond or in engagement with the record,
said box being also movable vertically to
and from the record, of a spring connected
20 with and adapted to elevate the box when
the needle thereof is not over the record, and
a shifter arranged to depress the box as the
needle is brought to operative position.

21. In a talking machine, the combina-
tion with a record, a tone tube, a sound box
25 connected with the tube, and means whereby
the tube and box may be moved so that the
latter may be supported with its needle be-
yond or in engagement with the record, said
box being also movable vertically to and from
30 the record, a spring operating to elevate the
box when the needle thereof is not over the

record, and a shifter adapted to depress the
box as the needle is brought over the record.

22. In a talking machine, the combina-
tion with a record disk, a sound box, and
35 means whereby the sound box may be moved
laterally over the disk and supported with
its needle beyond or in engagement with
the record on said disk, said box being also
movable vertically to and from the disk, of
40 a spring connected with and adapted to ele-
vate the box when the needle thereof is not
over the record, and a shifter adapted to de-
press the box as the needle is brought above
the record by lateral movement of the sound
45 box.

23. The combination with the tone tube
of a talking machine and with the sound
box and movable support therefor, of a
spring and connections for lifting said sup-
50 port, a shifter for shifting the connections
to lower the support as the needle is brought
to operative position, and a detent arranged
to automatically engage and hold the box in
its position when elevated.

In testimony whereof I affix my signa-
55 ture in presence of two witnesses.

AMI JACCARD.

Witnesses:

A. W. LEVY,
JACOB J. DORMAN.

J. VEIT.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED SEPT. 26, 1910.

979,231.

Patented Dec. 20, 1910.

Fig. 1.

Fig. 2.

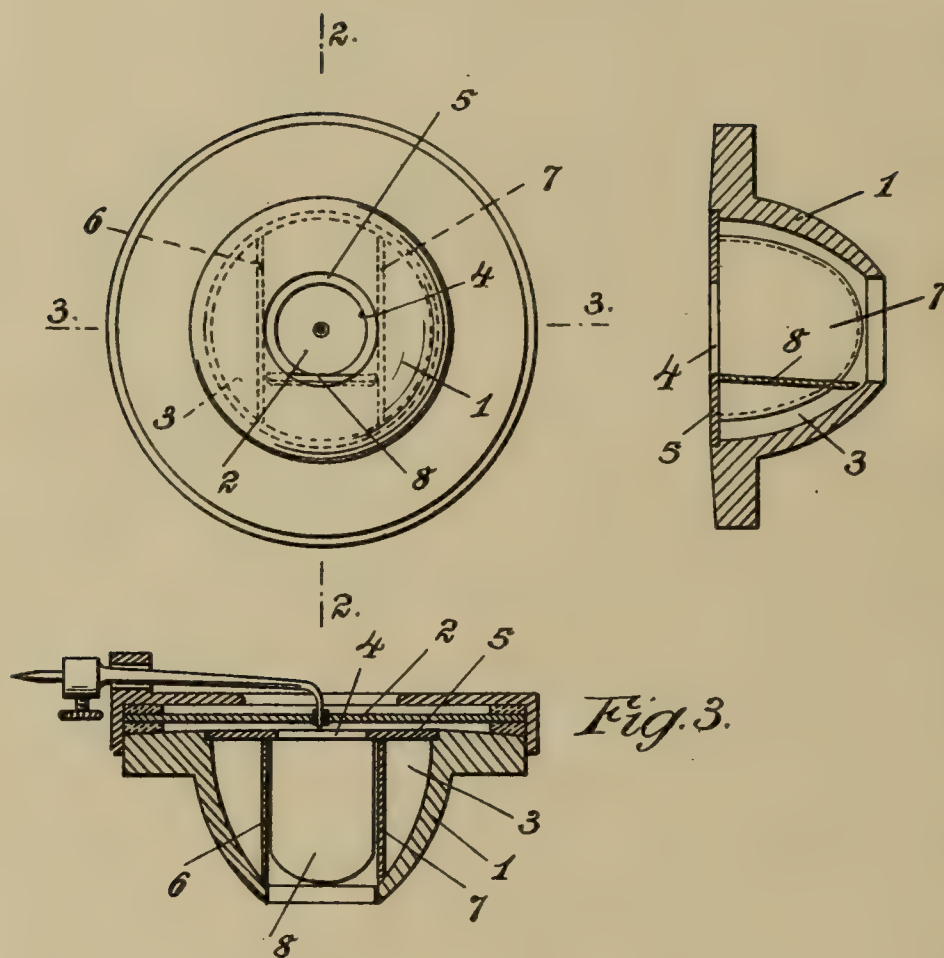


Fig. 3.

Witnesses
W. (Max) Durrall.
Byron B. Collings.

Inventor:
Johann Veit
by Wilkinson, Fisher and
Witherspoon, Attys.
by S. T. Fisher

UNITED STATES PATENT OFFICE.

JOHANN VEIT, OF HANAU, GERMANY.

SOUND-BOX FOR TALKING-MACHINES.

979,231.

Specification of Letters Patent.

Patented Dec. 20, 1910.

Application filed September 26, 1910. Serial No. 583,931.

To all whom it may concern:

Be it known that I, JOHANN VEIT, joiner, a subject of the German Emperor, and resident of Hanau-on-the-Main, Germany, with the post-office address Hospitalstrasse No. 25, have invented new and useful Improvements in Sound-Boxes for Talking-Machines, of which the following is a specification.

This invention has for its object to provide a sound-box for a talking machine which shall in shape resemble, as closely as possible, that of the human mouth. This end is attained by shutting off from the membrane the hollow portion of the sound-box (that is to say the portion which is connected with the horn) by a thin apertured wooden diaphragm and providing the hollow cavity with three thin strips of wood whereof a pair are fixed to the diaphragm as well as to the walls of the cavity, while the third which occupies a position between the other two, is in the form of a tongue and being attached to the diaphragm only and not to the walls of the cavity. In this construction the two fixed strips correspond to the human cheeks, the flexible strip corresponds to the tongue, and the remaining hollow space at either side corresponds to the gums. I have ascertained by experiment that surprising results, in respect of fullness and purity of tone, can be obtained by an arrangement of this kind and that the usual objectionable jarring noise emitted by talking machines is entirely done away with.

In the accompanying drawing which serves to illustrate the invention, Figure 1 is a front elevation of the improved sound-

box of my invention, and Figs. 2 and 3 sections on the lines 2—2 and 3—3 of Fig. 1 respectively.

In the drawing 1 is that portion of the wooden sound-box which is applied in front of the membrane 2 and which communicates with the sounding horn. The portion 1 is hollowed out in such manner as to form a cavity 3 which is closed on the side adjacent to the membrane by a wooden diaphragm 5 provided with an aperture 4.

6 and 7 are the two parallel thin strips which are secured, preferably by glue or other adhesive, to the diaphragm 5 and also similarly attached to the wall of the cavity 3, and 8 is the tongue or strip which is secured in the same way at one end to the diaphragm and free at the sides and other end so that it may have a spring-like action.

Now what I claim and desire to secure by Letters Patent is the following:

A wooden sounding box for a talking machine consisting of a hollowed out portion provided with an apertured diaphragm, a pair of parallel strips attached both to the diaphragm and to the walls of the cavity, and a tongue attached only to the diaphragm so that it may have a spring-like action, substantially as described.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this fourteenth day of September 1910.

JOHANN VEIT.

Witnesses:

JOHANN HOFMANN,
JEAN GRUND.

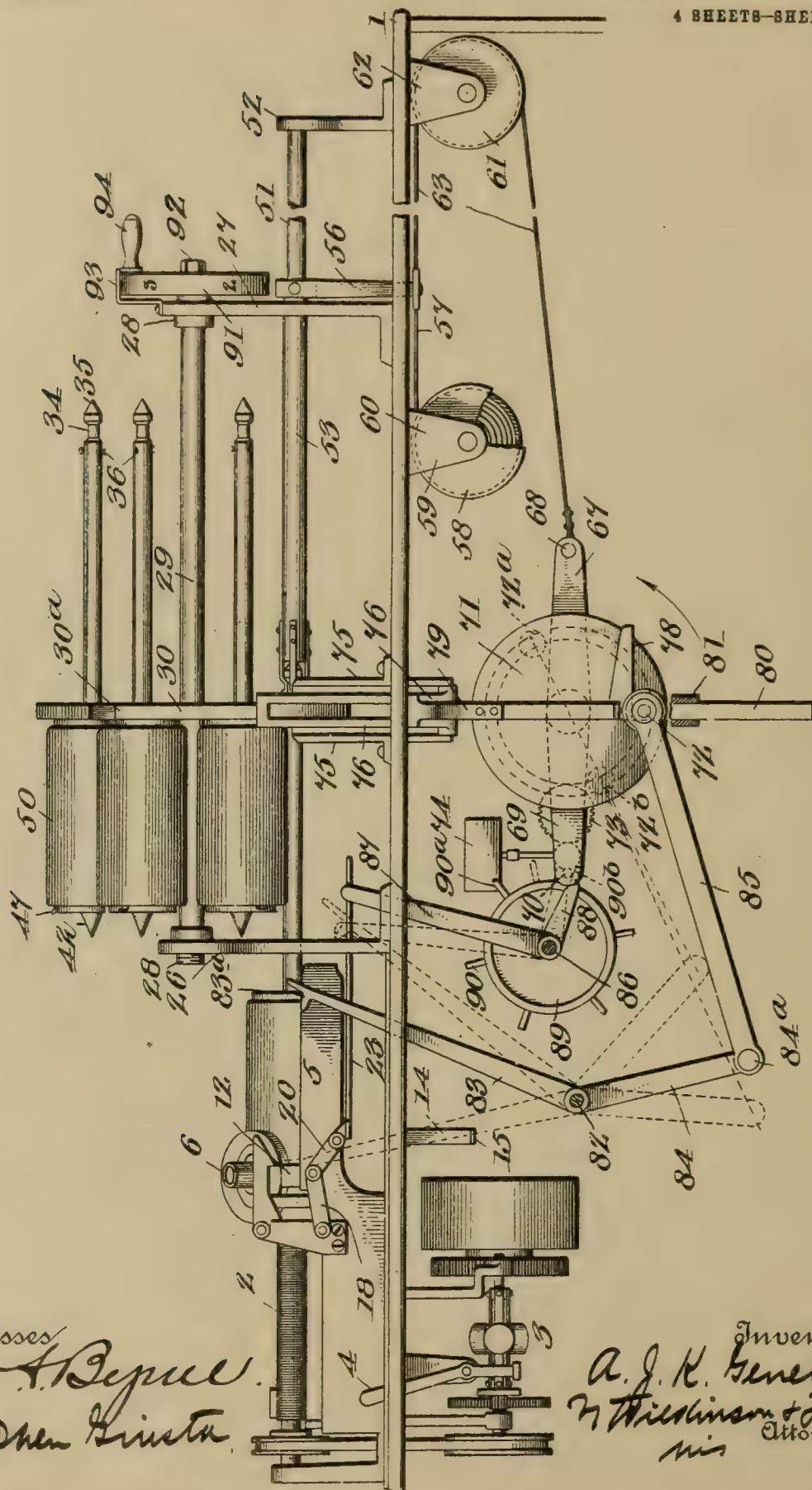
A. J. K. GENELLA.
 MULTIPLE RECORD GRAPHOPHONE.
 APPLICATION FILED JULY 31, 1906.

979,466.

Patented Dec. 27, 1910.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses
Geo. A. Bepue
Stephen L. Lister

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W. H. Dickinson & Sons
 Attorneys

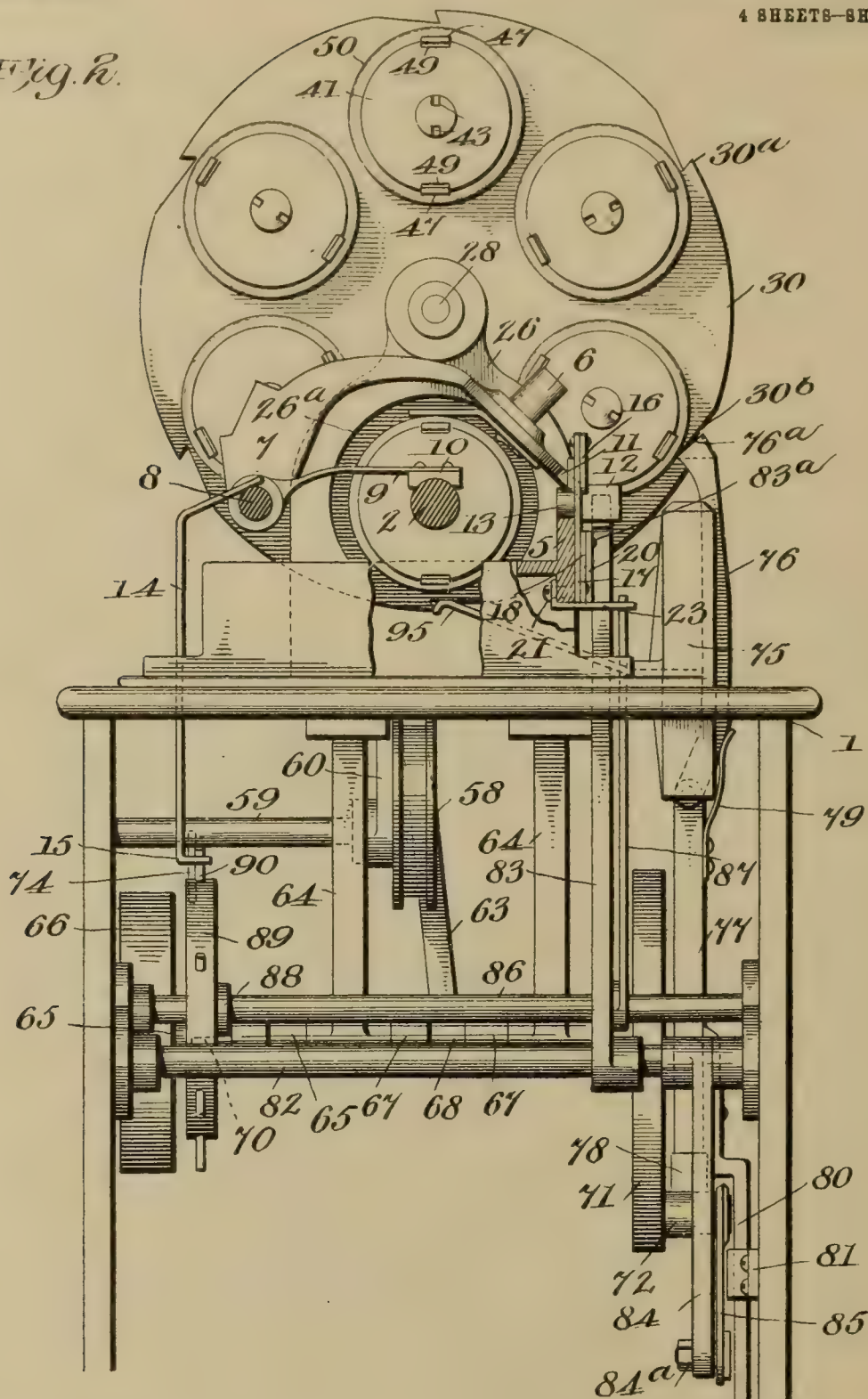
A. J. K. GENELLA.
 MULTIPLE RECORD GRAPHOPHONE.
 APPLICATION FILED JULY 31, 1906.

979,466.

Patented Dec. 27, 1910.

4 SHEETS—SHEET 2.

Fig. 2.



Witnesses

Geo. H. Bryce
 Joseph H. Kinstle

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 MULTIPLE RECORD GRAPHOPHONE.
 APPLICATION FILED JULY 31, 1906.

979,466.

Patented Dec. 27, 1910.

4 SHEETS—SHEET 3.

Fig. 3.

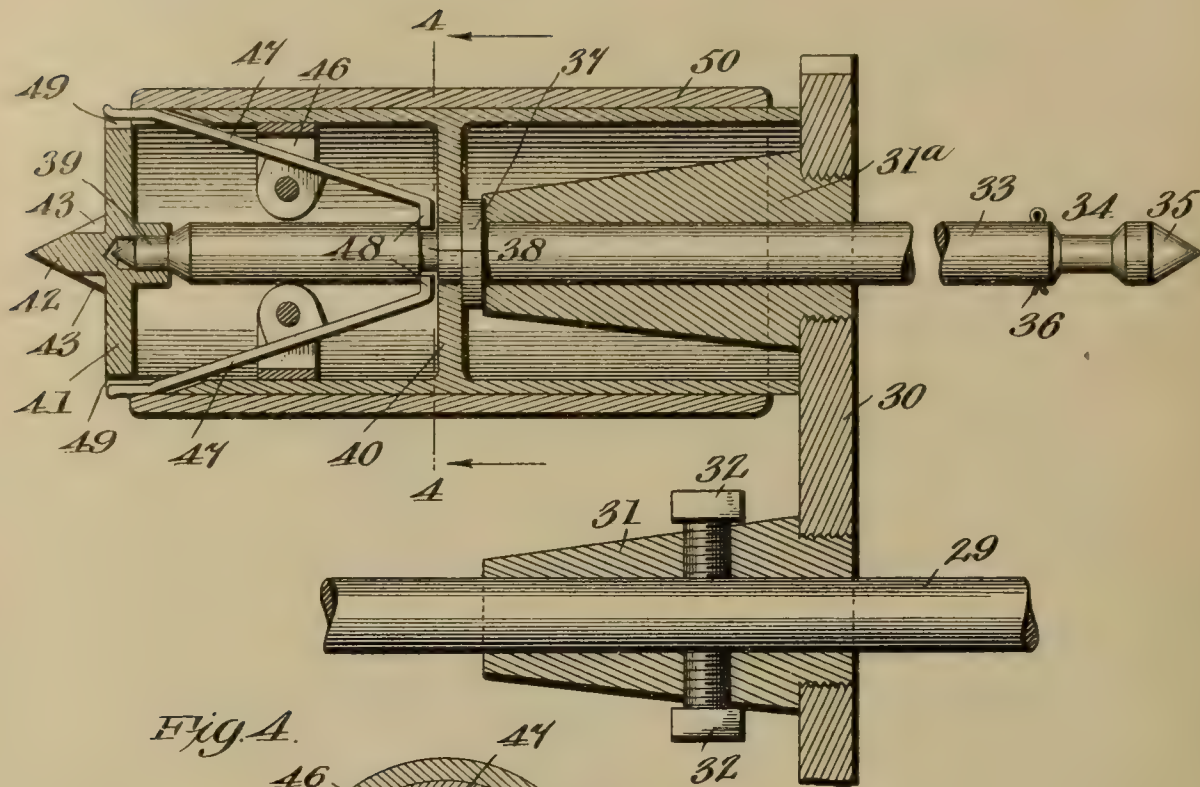


Fig. 4.

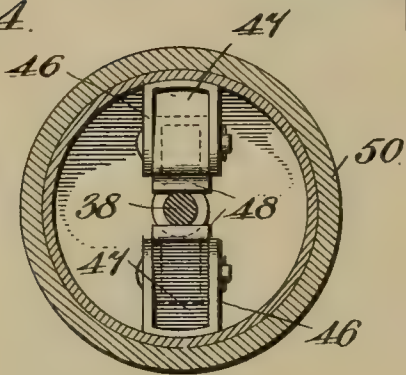


Fig. 5.

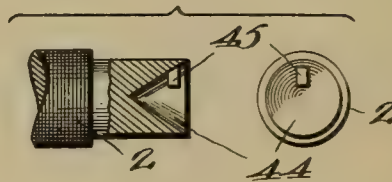
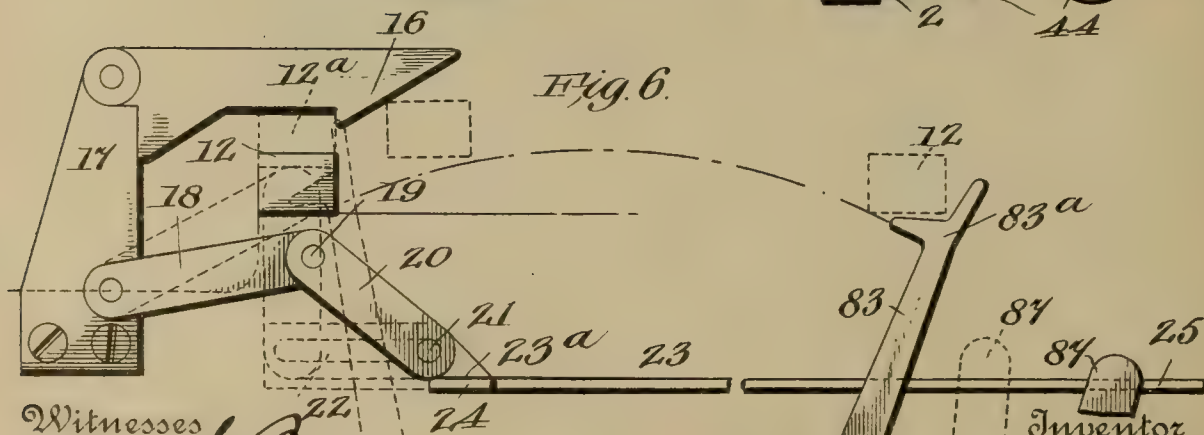


Fig. 6.



Witnesses

Geo. H. Deane.
 Stephen Kinata.

Inventor

A. J. K. Genella
 by Dickinson & Finner
 Attorneys

A. J. K. GENELLA.
 MULTIPLE RECORD GRAPHOPHONE.
 APPLICATION FILED JULY 31, 1906.

979,466.

Patented Dec. 27, 1910.

4 SHEETS—SHEET 4.

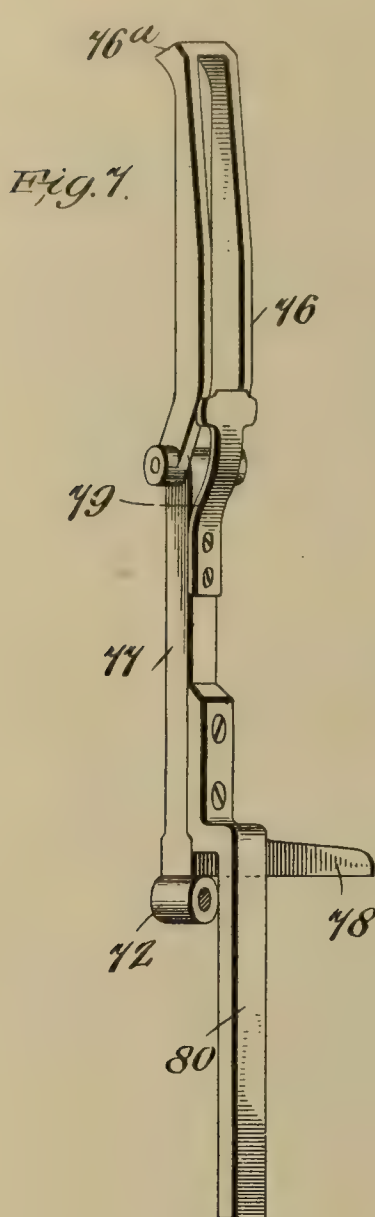


Fig. 7.

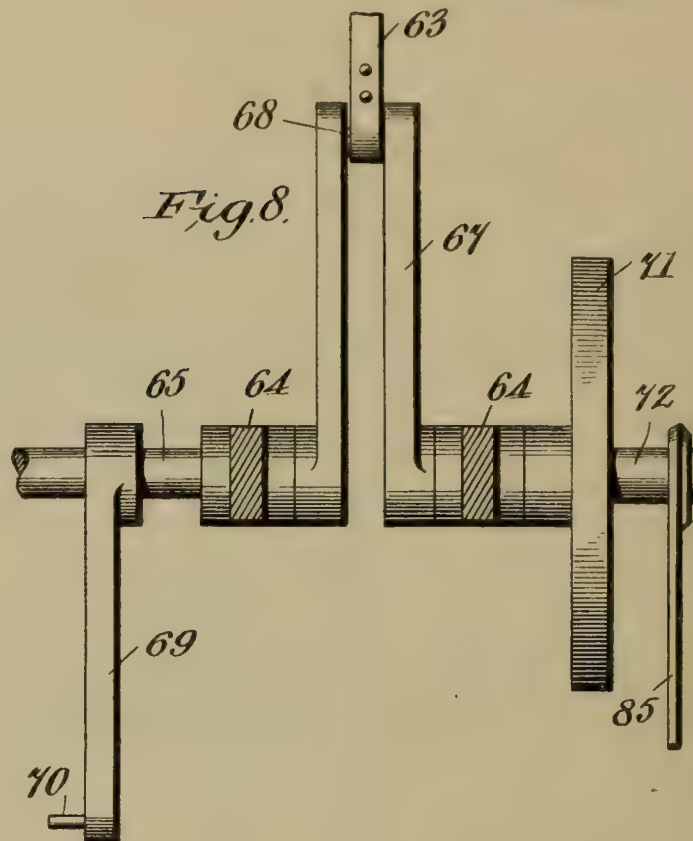
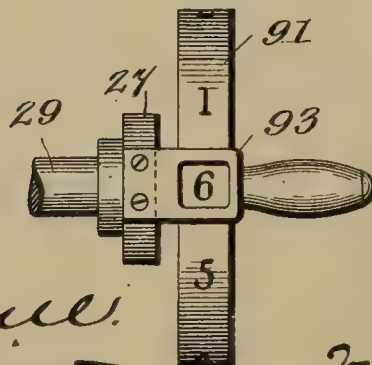


Fig. 8.

Fig. 9.



Fig. 10.



Witnesses
 Geo. A. Bynum
 Stephen Kinsten

Inventor
 A. J. K. Genella
 W. Dickinson & Fisher
 Attorneys

UNITED STATES PATENT OFFICE.

ALPHONSE J. K. GENELLA, OF NEW ORLEANS, LOUISIANA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GEORGE H. UNDERHILL, OF BOSTON, MASSACHUSETTS.

MULTIPLE-RECORD GRAPHOPHONE.

979,466.

Specification of Letters Patent. Patented Dec. 27, 1910.

Application filed July 31, 1905. Serial No. 271,939.

To all whom it may concern:

Be it known that I, ALPHONSE J. K. GENELLA, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Multiple-Record Graphophones; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in graphophones, gramophones and like machines, particularly to that class of the multiple record type.

It is obvious that it may be desirable to run off several records successively without interruption and without assistance of an operator, and this may be especially true in slot machines, and more particularly in cases where the machine is used for purposes of dictation wherein the subject-matter to be dictated would cover a number of record members.

The principal object of this invention is to provide mechanism, automatic in its operation, which will subserve this end.

Other objects and advantages will appear from the following description and the features of novelty of the invention will be more succinctly pointed out in the claims.

While in the following specification, for the purpose of simplicity, the invention is described more particularly with reference to graphophones of the ordinary type employing the usual reproducer and cylindrical record, it will be understood that the invention is not limited to this particular type of a reproducing machine, and the term "stylus" is employed to cover a recorder or a reproducer as the case may be, while the term "record member" or "record" is used to cover any kind of a record member before or after the record has been produced thereon, or whether the record member be used in connection with a machine of the graphophone or gramophone type, it being quite immaterial, whether or not the undulatory grooves of the record are of varying depth or width respectively.

To more fully describe the invention, reference is had to the accompanying drawings, illustrating an application of same, in which like letters designate the same parts in the several views, and in which:—

Figure 1 is a side elevation of the operating mechanism of the improved machine, certain minor parts being broken away. Fig. 2 is an end elevation looking to the right in Fig. 1, parts being broken away. Fig. 3 is a sectional view in detail of the rotary disk and one of the record members thereon, the disk, the record spindle and the supporting axis being broken away. Fig. 4 is a transverse section on the line 4—4 of Fig. 3. Fig. 5 is a fragmentary detail partly in section and an end view of the inner end of the stylus feed screw. Fig. 6 is a view in elevation, showing the operating members for returning the stylus to its initial position and holding the same raised until a new record has been placed in position, certain positions of the parts in this view being shown in dotted lines. Fig. 7 is a detail perspective view of the pawl member for automatically operating the revoluble disk. Fig. 8 is a plan view of the crank shaft and parts connected therewith, the hanger bars being shown in cross section. Fig. 9 is a detail view of an end of the plunger rod, and Fig. 10 is a detail view of means for rotating the rotary disk independently of the automatic means, and indicating the position of the records thereon.

1 designates a suitable frame-work, 2 the feed screw for the stylus, and 3, Fig. 1, the usual operating means for actuating the feed screw, 4 designating the usual thumb lever for starting or stopping the power actuated driving means.

5 is a plate or casing forming a means of support for the feed screw and also a protecting guard for the record.

6 is the usual recorder or reproducer which for brevity is termed the stylus carried by the arm 7 mounted on the bar 8 and brought into operative relation with the feed screw 2 by means of the arm 9 and threaded member 10. 11 is a short extension on the stylus having an enlarged head or a lug 12 thereon, the said lug 12 having a roller bearing 13 mount-

ed on its inside face and adapted to ride on the casing 5. The arm 7 also carries a depending rod 14 having a bent end 15, the function of which rod will hereinafter appear.

Referring particularly to Fig. 6, a latching mechanism is shown for holding the stylus elevated, when shifted back to its initial position, until the next record has been put in place, the operation of which latching mechanism will be hereinafter described. The details of this construction consist of a latch member, having the hook 16, normally disposed horizontally and pivotally connected to an upright 17 secured to the support 5. Below the latch member and pivotally connected at one end to the upright 17 is a flat link 18 pivotally connected as at 19 to the end of a similar link 20 having a pivot screw 21 operating in a slot 22 formed in a vertical flange of an oscillating plate 23, which oscillating plate has the lugs 24 and 25 projecting edge-wise thereof. In this figure the solid lines indicate the position of the parts when the stylus initially engages the record member, while the dotted lines to the left indicate the position of the parts when the stylus has been returned to its initial position and forced into engagement with the latch member 16 to hold the same in its elevated position until the old record has been replaced by the new one.

26 is a standard suitably secured to the frame 1, which standard has an enlarged base portion with an annular opening 26^a therein. 27 is a standard also suitably secured to the main frame 1. Both of these standards at their upper ends are provided with the detachable bearings 28 in which bearings is journaled reduced ends of a main shaft 29, the outer end of said shaft projecting beyond the standard 27. On this main shaft 29, referring particularly to Fig. 3, is mounted a disk 30 provided on its circumferential edge with a plurality of ratchet teeth 30^a and on its inner face with a detachably mounted elongated central bearing 31 and a plurality of circumferentially disposed similar bearings 31^a. The shaft 29, passing through the bearing 31, is securely locked to the disk by the set screws 32, so that the disk and the shaft 29 rotate together.

Freely passing through the bore of each of the elongated bearings 31^a is the reciprocating spindle 33 having the reduced portion 34 and headed portion 35 preferably conical, forming a recessed outer end.

36 is a stop which may be of the split pin type.

37 is an annular shoulder formed on the spindle, 38 a reduced portion forming an annular recess, and 39 a reduced end, forming a pintle preferably finished off conically.

Adapted to be mounted on the spindle is a

mandrel having the central apertured web 40 and outer end plate 41 provided with the conical bearing 42 having a plurality of recesses 43, which conical bearing is adapted to be brought into engagement (Fig. 5) with a conical depression 44 in the inner end of the feed screw 2, which conical depression is provided with the inwardly projecting lug 45. The mandrel is also provided with a plurality of U-shaped internal bearings 46, to which are pivotally secured the spring arms 47 having projections 48 adapted to rest in the recessed portion 38 and the outer ends of said spring arms extending through elongated apertures 49 in the cylindrical and end faces of the mandrel, which projecting ends may be operated to spring the projections 48 out of engagement with the operating spindles, for readily removing the mandrel and the record 50 carried thereby. It might be stated here that this particular construction of a mandrel and the spindle with reference to the spring arms 47 and the recessed portion 38 would be unnecessary excepting for the fact that the present form of records have a tapering bore, the enlarged end of which is to the left of the record, so that in use, with records of the present type, it is necessary to slip the record on the mandrel from the right hand side of the mandrel, and this particular structure allows of a ready means of removing the mandrel and record for this purpose, to replace a new record without pulling out the spindle 33, the right to left movement of which is limited by the stop pin 36. It will be observed, however, that with new forms of records tapering in the reverse direction, this detail construction would be unnecessary as the mandrel could be revolvably mounted on the spindle, in a fixed relation axially, and the record slipped thereon from the left end of the mandrel. However, this particular construction of mandrel might be employed to advantage, as an interlocking means, with either form of record.

51 is a bearing rod rigidly supported by the standard 52, this rod in Fig. 1 being shown broken away.

53 is a hollow reciprocating plunger rod mounted on the rod 51 and adapted to freely pass through an aperture formed in the standard 27. The inner end of this rod (Fig. 9) is provided with a plurality of longitudinally disposed spring clips 54 suitably secured thereto and provided at their free ends with inwardly converging depressed portions 55, adapted to spring over the heads 35, of the spindles 33, into the recessed portion 34 thereof.

56 is a vertically disposed bar connected to the outer end of the hollow plunger rod 53 and to this bar is connected a tape 57 preferably of metal attached at one end to a

power actuated drum 58 journaled on a shaft 59, one end of which may be mounted in the side frame (Fig. 2) and the other end in a hanger bar 60. This drum is preferably a
 5 spring-actuated one as shown, of sufficient power to shift the plunger rod 53, with a spindle and record, to the left, as hereinafter described, when the drum is free to revolve.

10 61 is an idler pulley mounted on a shaft journaled at one end in the main frame and at the other end in a hanger bar 62. 63 is a metallic tape secured at one end to the bar 56, reeling over said pulley 61 and connected
 15 at its other end to a crank hereinafter described.

64 are a pair of hanger bars suspending a power actuated shaft 65, the power for rotating same being indicated in the drawings, as a spring actuated drum 66 (Fig. 2). As
 20 shown in detail in Fig. 8, this shaft is formed with the spaced crank arm 67 having the connecting crank pin 68 at its outer end, to which is connected one end of the
 25 tape 63. Reversely opposed to said crank shaft 67 but out of alinement therewith is the bar 69 rigidly affixed to the shaft 65 and provided at its outer end with the laterally projecting pin 70. Also securely keyed
 30 to the shaft 65 is the disk 71 provided with the eccentrically mounted pin 72 acting as a crank pin.

73 (Fig. 1) shows conventionally a connection between the power-actuated drum 66
 35 and a speed governor or fan 74 also operating as a stop, as hereinafter referred to.

75, Figs. 1 and 2, are guide plates suitably secured to the frame 1 on both sides and adjacent to the disk 30, and between these
 40 guide plates is slidingly mounted a pawl member (shown in detail in Fig. 7) adapted to engage and intermittently rotate said record disk. This pawl member 76 comprises the spaced side members merging at
 45 their upper end in a solid beveled cross piece of a peculiar angle (for a purpose hereinafter referred to), the lower ends of said spaced members being pivotally connected to a bar 77 having a laterally projecting
 50 foot 78 of a length to extend transversely beyond the path of travel of the pin 72. To this bar is secured a flat spring 79 in engagement with the pawl 76 for holding said pawl against the disk 30 but permitting
 55 the pawl to ride freely over the surface of the disk between its teeth.

To the lower end of the foot bar 77 is secured a depending angle bar 80 operating in a socket piece 81 secured to the frame,
 60 which depending bar serves as a guide for the vertical reciprocation of the pawl member.

82 is a rock shaft suitably journaled to the side frames, as shown in Fig. 2, which rock

shaft is provided with upwardly and downwardly disposed arms 83 and 84 respectively, arranged at angles to each other and which arms may be provided with any suitable means for adjusting their angular position, such as set screws, it being understood that
 70 these arms rock with the shaft 82. The upper arm 83 which I will term the stylus arm is provided with a hooked end 83^a for a purpose hereinafter referred to and the lower arm 84 forms a connecting link between the rock shaft 82 and the disk 71 by
 75 means of the link 85 pivoted at one end to the eccentric pin 72 and at its other end to the bar 84 as at 84^a. 86 is another rock shaft suitably journaled in the side frames and
 80 on this rock shaft is rigidly secured a lever 87 extending upwardly and adapted to engage the projecting lug 25 of the reciprocating plate 23, which plate 23 is held in position at one end by the pin 21 riding in
 85 the slot 22 of the vertical member 23^a of the plate 23, while the other end is slidingly supported in a slot through the standard 26. The secondary rock shaft 86 at its opposite end is provided with the tripping lug 88
 90 which is adapted to extend in the path of travel of the pin 70 on the revolving bar 69. It will be understood also that the lever 87 and tripping lug 88 are fixedly secured to the shaft 86, but may be so fixed
 95 by means of set screws for adjusting their angular relation. 89 is a wheel rotatably journaled on the rock shaft 86, adjacent said tripping lug, but engaging said shaft with sufficient friction to prevent it revolving too
 100 freely. On the peripheral surface of this wheel, which I will term the controlling wheel, are a plurality of projecting pins 90 adapted to be successively engaged by the fan 74 and the pin 70.
 105

91 (Figs. 1 and 10) is an indicating wheel secured to the projecting end of the main shaft 29 by means of a nut 92. This indicating wheel is provided with numerals on its peripheral surface, corresponding with
 110 the number of mandrels on the record disk, which numerals are adapted to be brought beneath an apertured plate 93 secured to the standard 27, and this wheel is provided with a handle 94 by which the wheel, the shaft
 115 29, and consequently the record disk 30 may be revolved to bring any record into position independently of the automatically operated pawl before referred to.

In operation, the various parts being in
 120 the position shown in Figs. 1, 2, and 6, wherein the stylus is in starting engagement with the left hand end of the record, upon shifting the starting lever 4, thereby imparting a continuous motion to the feed
 125 screw 2, the conical point 42 of the spindle being interlocked with the feed screw, this spindle, its mandrel, and record will be ro-

tated while the stylus is being fed therealong. When the stylus has reached the end of the cylinder, the transverse portion 15 of the depending bar 14 will strike one of the pins 90, which will rotate the wheel 89 forwardly, moving the pin 90^a out of engagement with the fan 74. This starts the power actuated wheel 71 revolving in the direction of the arrow (Fig. 1) and with the pin 70 on the revolving bar in engagement with the pin 90^b, will rotate the controlling wheel 89 still farther, bringing the pin 90^a into the position shown in dotted lines, at which point the pin 70 will have left the pin 90^b. As the disk 71 starts to revolve the shaft 82 is rocked at its fastest speed (as the pin 72 approaches the point 72^a) and the hooked portion 83^a being in the position shown in Figs. 1 and 6 (the position of the lug 12 being shown in dotted lines in the latter figure), the lug 12 and consequently the stylus is immediately elevated from the record, moving in an arc of a circle, as indicated in dotted lines in Fig. 6, until it strikes the hooked end 16 of the latch member, forcing the latter upwardly and passing in a position to the left of the hook 16. At the same time the stylus arm 83 striking the lug 24 on the plate 23 will force the pivoted ends of the links 18 and 20 upwardly, which ends engaging beneath the lug 12 will elevate and hold the same elevated in engagement with the hook member 16, as indicated in dotted lines at 12^a in Fig. 6. From the point 72^a, the continued rotation of the wheel 71 will slowly rock the shaft 82 rearwardly until the eccentric pin 72 reaches the position 72^b, when the stylus arm 83 will be in a position beyond its initial position, as indicated in dotted lines. During this rearward movement of the stylus arm 83, it will be seen that when the hooked end 83^a starts to the right, the stylus is held elevated by the links 18 and 20 and the lug 12 being engaged by the hook member 16, the stylus will remain in this position. Upon the eccentric pin moving from the position 72^b to 72 the shaft is slowly rocked forward again and the stylus arm brought to its initial position. From the beginning of the rotation of the disk 71 the eccentric pin 72 being disposed beneath the shoes 78 will elevate the pawl member until the eccentric pin 72 is diametrically opposite its starting point, when the pawl will have engaged with the next tooth 30^a on the record disk 30. Also upon the disk starting, the crank 67 (when it reaches a point substantially in a horizontal plane with the lower peripheral surface of the pulley 61, which initial movement permits of the stylus being raised before the initial movement of the record being withdrawn) exercises a pulling force on the tape 63 which operates the bar 56, re-

ciprocating the hollow plunger 53 along the rod 51 and the spring fingers 55 being in engagement with the headed end of the spindle, will withdraw the spindle and the used record toward its initial position (the record passing through the enlarged circular opening 26^a in the standard 26) until the shoulder 37 on the spindle strikes the end of the bearing 31^a, at which point the mandrel will be in its initial position and the springs 55 upon continued movement of the plunger 53 will spring outwardly and pass over the headed portion of the spindle. The crank pin 68 will now have reached a position diametrically opposite its starting point, and (the pin 72 being in a position, with reference to the disk at right angles to the pin 68), the pin 72 will also at this point have reached a position diametrically opposite its starting point, whereupon it leaves the shoe 78, and the shoe and the pawl member will fall of their own weight, rotating the record disk 30 one notch. By the peculiar construction of the pawl, the rotation of the disk will be locked in the proper position. That is to say the flat surface 76^a will engage the edge surface of the disk, indicated for illustration at 30^b, Fig. 2. To prevent jarring of the record disk by a too sudden drop of the weighted shoe and pawl, there may be provided a spring (Fig. 2) which will act as a retarding means and will also be a further positive means of locking the disk when it has reached its proper position.

When the arm 67 has reached a position diametrically opposite its starting point and starts to leave that position, the tape 63 begins to slack and the spring-operated drum 58 through the tape 57 and rod 56 will begin to force the plunger rod 53 forward, but as the pawl 76 begins to drop at the same moment, the arm 68 starts to leave the position just referred to, the disk will have been rotated before the spring clips 55 strike the headed end of the new spindle which has been brought into position during said rotation, and the spring clips 54, striking the conical headed end 35 of the new record spindle, will be distended and ride over the conical head until the depressions 55 reach the recessed portion 34, when they will recede therein and interlock the plunger rod with the spindle. The continued forward actuation of the plunger rod will then obviously force the spindle with its record toward the stylus. When the crank 67 and the revolving bar 69 are about to assume their initial positions, with the new record nearly in position, the pin 70 on the revolving bar 69 strikes the pin 90^a (being located in the position shown in dotted lines) and rotating the wheel 89 farther brings the next succeeding pin into position

in front of the fan 74. Just before this happens, however, the pin 70 will have engaged the tripping lug 88 which rocks the shaft 86, moving the lever 87 to the right, and the latter being in engagement with the lug 25 will pull the plate 23 to the right, collapsing the links 18 and 20 and allowing the stylus to fall into operative position at the same moment that the point 42 on the mandrel has been interlocked with the feed screw and one of the pins 90 has been brought into position to stop the fan 74, and consequently the power actuated disk 71, when the parts are all in their initial positions. The operation is automatically repeated until the lever 4 is moved to shut off the actuating power for the feed screw.

While the foregoing illustrates an application of the invention, it will be understood that I do not wish to be limited to the exact details as described and illustrated in the drawings, as it is obvious that various modifications might be made without departing from the spirit of the invention, but

What I claim is:—

1. The combination with a stylus and feeding means therefor, of a rotary disk, a plurality of reciprocating spindles mounted on said disk, records carried by said spindles, means for reciprocating said spindles, means for intermittently rotating said disk, means for returning said stylus to its initial position, and power controlled mechanism operatively associated with said respective means.

2. The combination with a stylus and feeding means therefor, of a rotary disk, a plurality of reciprocating spindles carried by said disk, an interlocking plunger rod for said spindles, means for operating said plunger rod, means for intermittently rotating said disk, means for returning said stylus to its initial position, and power controlled mechanism operatively associated with said respective means.

3. The combination with a stylus and feeding means therefor, of a rotary disk, a plurality of reciprocating spindles carried by said disk adapted to support the records, a plunger rod, spring fingers on said plunger rod forming an interlocking means between same and said spindle, means for reciprocating said plunger rod, means for intermittently rotating said disk, means for returning said stylus to its initial position, and power controlled mechanism operatively associated with said respective means.

4. The combination with a stylus and feeding means therefor, of a rotary disk, a plurality of reciprocating spindles carried by said disk adapted to support the records, a stop for limiting the reciprocation of said spindles, heads formed on one end of said spindles, a plunger rod, spring clips having

depressed portions carried by said plunger rod, adapted to spring over said headed portion of the spindles and form a detachable interlocking means between one of said spindles and said plunger rod, means for reciprocating said plunger rod, means for intermittently rotating said disk, means for returning said stylus to its initial position, and power controlled means operatively associated with said respective means.

5. The combination with a stylus and feeding means therefor, of a rotary disk provided with ratchet teeth on its peripheral edge, a plurality of reciprocating spindles carried by said disk and adapted to support the records, means for reciprocating said spindles, means for intermittently rotating said disk, comprising a reciprocating spring controlled pivoted pawl engaging said disk, and composed of spaced side bars and a lateral top plate forming an engaging tooth, means for returning said stylus to its initial position, and power controlled mechanism operatively associated with said controlling means.

6. The combination with a stylus and feeding means therefor, of a toothed rotary disk, a plurality of reciprocatingly mounted records thereon and means for reciprocating same, a vertically operating pawl member engaging said disk and provided with a lateral foot at its lower end, an oscillating stylus arm for returning said stylus to its initial position, a power controlled rotary disk, an eccentrically mounted pin thereon adapted to travel in the path of said foot, connecting means between said eccentric pin and stylus arm, means operatively associated with said power controlled disk and said reciprocating records, and means for automatically stopping and starting said power controlled disk.

7. The combination with a stylus and feeding means therefor, of a rotary disk, a plurality of reciprocating record spindles mounted on said disk, an interlocking plunger rod for said spindles, a power actuated shaft, operative connections between said shaft and plunger for reciprocating the latter in one direction and means operatively connected with the plunger for reciprocating same in the reverse direction, means operatively associated with said shaft for intermittently rotating said disk, a revolving arm carried by said shaft, a rock shaft, a star or controlling wheel journaled on said rock shaft, controlling means between said star wheel and power actuated shaft, a tripping lug on said rock shaft, an upright lever on said rock shaft, a pin on said revolving arm disposed in the path of travel of said tripping lug and star wheel, an oscillating stylus arm for shifting the stylus to its initial position, connections between

said stylus arm and said power actuated shaft, a latch for said stylus, vertically moving means for holding said stylus in engagement with said latch, and a reciprocating member controlling said vertically moving means and engaging said lever.

8. The combination with a stylus and means for feeding same, of a rotatably mounted toothed record disk, reciprocating record spindles mounted thereon, an interlocking plunger rod for said spindles, a power actuated crank shaft, a crank on said shaft, a revolving arm on the opposite side of said shaft, flexible means operating between said crank and said plunger rod for reciprocating the latter in one direction, actuating means for reciprocating said plunger rod in the reverse direction, a pin eccentrically carried by said crank shaft, a vertically reciprocating pawl member engaging said rotary record disk, a foot carried by said pawl member disposed in the path of travel of said eccentric pin, a rock shaft, an upright lever on said rock shaft, a tripping lug on said rock shaft, a star controlling wheel on said rock shaft adjacent said

tripping lug, stop mechanism interposed between said star wheel and power actuated shaft, a pin on said revolving arm adapted to be brought into engagement with said star wheel and tripping lug, an oscillating stylus arm, link connections between said stylus arm and eccentric pin, means carried by the stylus adapted to engage said star wheel, a latch for said stylus, means for holding said stylus elevated upon its return to its initial position comprising vertically movable pivoted links operatively associated with said stylus member for forcing same into engagement with said latch, a reciprocating plate connected to one of said vertically moving links, and projections at opposite ends of said plate adapted to be engaged by said stylus arm and upright lever respectively.

In testimony whereof, I affix my signature, in presence of two witnesses.

ALPHONSE J. K. GENELLA.

Witnesses:

C. PERA,

L. J. GENELLA.

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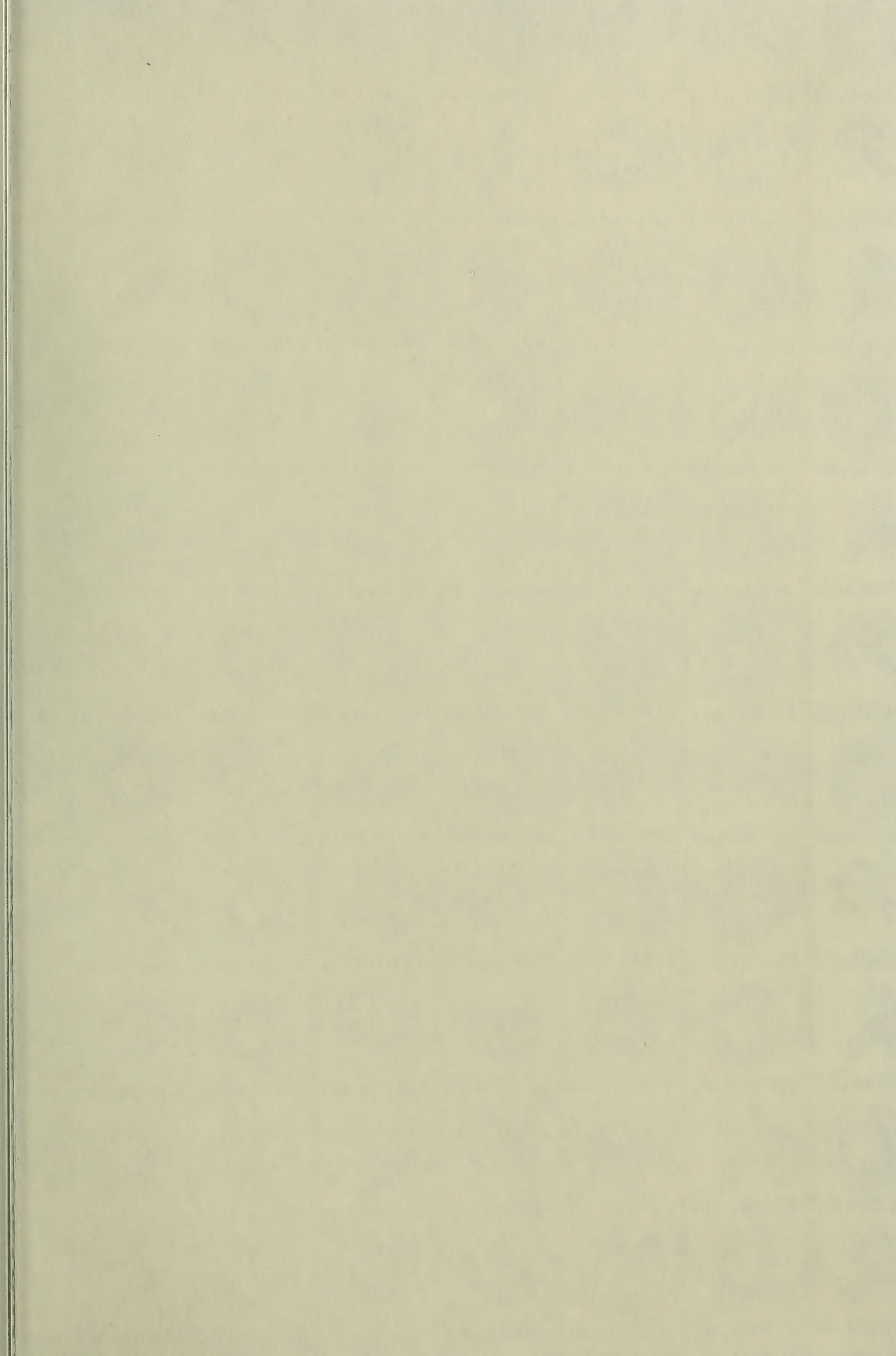
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